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Canada's Personal Computing Magazine

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October 1986

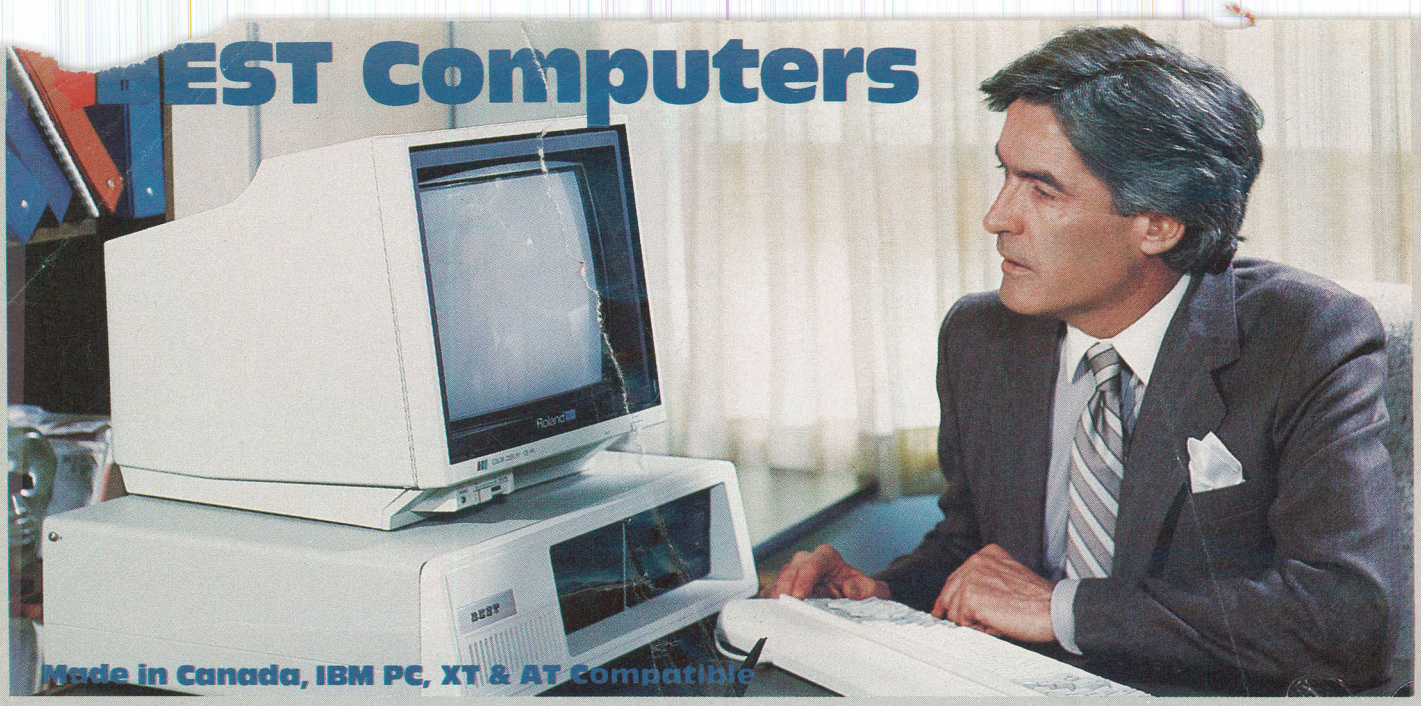
Of Mice and Machines

A Hardware Issue

- Summa Mouse
- Logimouse
- Idetix PC Camera
- Sloth at Last

Public Domain Software

BEST Computers



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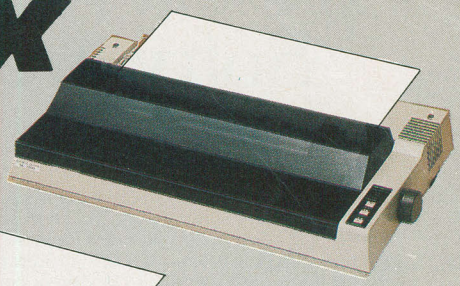

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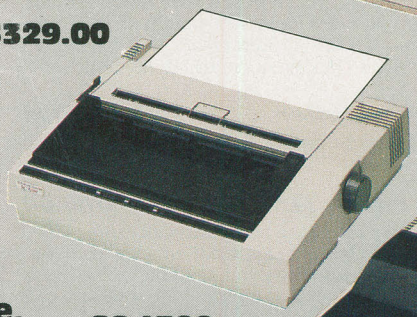

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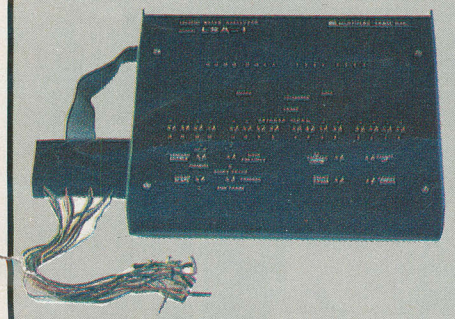

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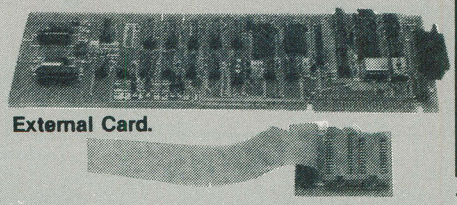
EPROM PROGRAMMER



External Card.

This card can program any one of the following EPROMs: 2716, 2732, 2732A, 2764 and 27128s. Two sockets are available on the adaptor board, one for the 28-pin EPROMs, the other for 24-pin types. These sockets are standard sockets, however as an option ZIF sockets can be used (we recommend ZIF sockets if large numbers of EPROMs will be programmed). Also as an option an extension board is available. This board attaches to the adaptor via a ribbon cable and extends out the back panel. This is to allow EPROMs to be programmed without removing the cabinet cover every time programming is to be performed. Also as a standard feature, the source software is supplied to allow users to modify the program to suit their needs.

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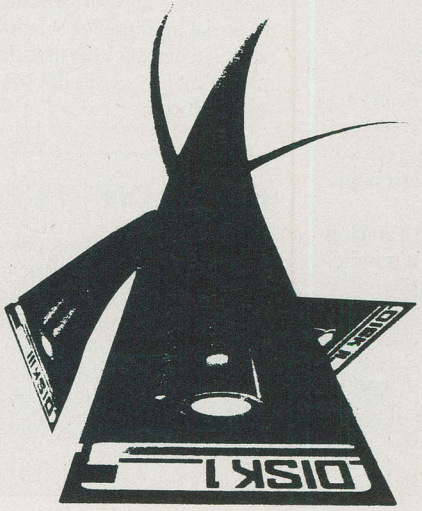

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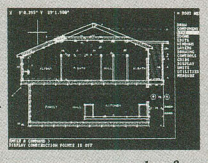

LOGICADD—Generic CADD 2.0 and Dot Plot

Generic CADD is the sensational, new CADD package that offers the features and performance of high-priced at an unbelievably low price. The package also includes DotPlot, the add-on utility that turns your dot matrix printer into a plotter.

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by Marie Hubbs

New Blue Systems

● The Lanpar PC, a Canadian made, **low-cost IBM PC compatible** from *Lanpar Technologies*, has 256K of RAM upgradeable to 640K, eight expansion slots and one standard sized floppy drive. Options include a second floppy or hard drive, and choice of monochrome or colour monitor. Configurations vary in price from just over one thousand dollars to about twenty-six hundred; quantity discounts also available.

For more details, contact Lanpar Technologies, 85 Torbay Road, Markham, Ontario L3R 1G7, telephone (416) 475-9123.

● From *Sharp* comes a new **IBM PC compatible portable**, the Sharp 7000. Running popular IBM software, the 7000 features a 25 by 80 illuminated crystal display, two built-in standard sized floppy disk drives, and 320K RAM upgradable to 704K, all for $2,695.00; it weighs close to nineteen pounds. Options include an internal modem card for $499.00 and a correspondence quality printer for $649.00.

In the Greater Metropolitan Toronto area, contact Total Office Systems, 1050 McNicoll Avenue, Unit 14, Scarborough, Ontario M1W 2K8, telephone (416) 493-3575. Sharp Electronics is located at 335 Britannia Road East, Mississauga, Ontario L4Z 1W9, telephone (416) 890-2100.

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● An IBM **AT compatible portable** from *Toshiba*, the T3100 features 640K RAM standard expandable to 1.6 megabytes, one 3.5 inch microfloppy drive and one 10 megabyte hard disk, 25 by 80 gas plasma display, and, of course, the 80286 processor, all in a fifteen pound package.

With a list price of $7,500, it's available from Toshiba dealers, or contact the company direct at 500 Alden Road, Markham, Ontario L3R 5H5, (416) 479-4004; there's also a Canada-wide toll free number, 1-800-387-4347.

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● And then there's the DWK Personal Computer, a Canadian-engineered, **XT compatible** with eight expansion slots, 256K RAM memory, single standard disk drive and video card, all for just under eighteen hundred dollars. Monitors and additional disk drives are optional.

Call them for the dealer nearest you: *DWK Data Systems*, 2399 Cawthra Road, Unit 14, Mississauga, Ontario L5A 2W9, (416) 273-7440.

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Updating C

Datalight's great little **C compiler** just got better with the release of version 2.10. New and improved features include ANSI standard function prototyping, new library functions and several internal compiler and library bug fixes. Owners of earlier versions can upgrade for very little. Also available is a Datalight C to Developer's Kit.

For more details, exact prices and local availability you can contact Datalight at P.O Box 82441, Kenmore, Washington 98028, or by calling (206) 821-6128.

Continued on page 78

Next Month In

Computing Now!
Canada's Personal Computing Magazine

TEX

If you've never heard of text you're probably not alone. However, TEX is the most powerful personal typesetting and publishing program over to walk the planet. It can make typesetters and laser printers do things even their manufacturers weren't sure they were capable of, and makes the whole processes more or less comprehensible to human beings.

Microcomputer implimentations of this engrossing package, complete with the ultimate in amusing funky manuals by its author, are cropping up for a number of computers, including the PC and the Mac. In the next edition of Computing Now! we'll have a look at TEX, what it's capable of and why it can be so powerful for many personal publishing applications.

Music Supplement

The next edition of Computing Now! will feature a special insert on top of its regular editorial with a comprehensive update for computer musicians. The latest MIDI hardware and software is staggering. There are new toys to play with, updates to previous efforts and a growing number of sparkling new applications. In the music suppliment we'll be having an in depth look at some of the new controllers and sound sources and a general overview of the latest new things.

WindowWorks

The code needed to open a window on the screen of a PC and manipulate can be enormous... unless you have a windowing package. In the next edition of CN! we'll be getting into our own custom written windowing software and how to use it. Plug in some windows and even the nastiest little application program can become slick, professional, lightening fast and easy to write.

These features are in an advanced state of preparation. However, in endeavouring to keep Computing Now! as up to the minute as possible we reserve the right to change the contents of this issue prior to going to press.

Quest for the Perfect Rodent

Trapping a suitable mouse for use with a PC can be a bit of a labour... the problem growing with each new addition to the species. This feature checks out two of the best rats.

by Steve Rimmer

Quite a few of the things that turn up in Computing Now! stem from solutions to problems or the finding of answers. A lot of the problems and answers are things that readers, friends, associate workers or other humans lay on me... when all the dust settles there's usually an article in there somewhere.

This article, however, is self inspired. A while ago I decided that I'd dwelt upon the planet long enough without a mouse for my PC and set about trying to get one. This was, in some respects, a mistake. Because manufacturers of computer related things seem prepared to loan us anything we want... presumably in the hope that we'll write about them... I was very shortly knee deep in all manner of plastic mice, each one with its own floppy disk full of drivers and its own tale to tell.

Fortunately, when one turns out the lights and goes home at night, computer mice don't do what the real ones do, and the mouse count eventually leveled off.

The two remarkable things about the PC mouse population are that it's quite large and of widely varying usefulness. There are a lot of mice about and a lot of them are highly funky. Mice have probably replaced modems as the galaxy's cheapest... and most abused... peripheral.

I eventually narrowed things down to two mice, which I think are pretty well the top of the heap. We're going to check 'em out now.

Lab Rats

My first encounter with a useable mouse was with the one attached to the Macintosh... which really does spoil one for most other efforts along these lines. The Mac mouse is a model of comfort and accuracy. For a long time, nothing available for the PC even approached this.

The PC mice that I played with in conjunction with this article were all of basically the same sort. A mouse itself is a serial device... in the cases of both the mice we'll look at here, plan to lose one of the PC's two primary serial ports. The serial information spewing from a mouse is trapped by an installable device driver which fakes out the PC, making it believe that its keyboard is actually sending it keys that correspond to what the mouse is up to. The usual arrangement in this respect is to have the four directions in which the mouse can move correspond to the four arrow keys.

Most mouse drivers allow one to define which keys will be sent by the trackball.

In addition to the four direction keys, mice usually have buttons. PC mice seem to have settled on three buttons. Again, you can generally have each button spew out one or more characters of your choosing.

The two critical areas of applying any mouse to your applications are first in the operation of the mouse itself and second in how well the support software interfaces it to the PC. Some of the mice I looked at had appallingly badly written support software which wouldn't hook them into other applications reliably, rendering them pretty well useless.

The first mouse I tried... and probably the most widely available one... was the Microsoft mouse, which was highly disappointing. It does work... a rare asset in the field of mice... but it feels all wrong, and is very unforgiving of the sorts of surfaces it gets rolled over. The only advantage in the Microsoft mouse is that it, and its attendant software, are accepted everywhere... just about any application with a cursor will relate to the Microsoft mouse.

To this end, most of the mice which emerged after the Microsoft effort will emulate a Microsoft mouse, a valuable consideration.

I also tried quite a few Far Eastern knockoff mice. There are a lot of mouse clones. I don't really have anything against cheap stuff from Korea and Taiwan... in fact, I own quite a lot of it. Some of the technology you come upon, Chinese instructions notwithstanding, is pretty good. I think that some of the low budget mice I tried weren't half bad, but they all seemed to have really uncool software. It was largely impossible to tell if they were working properly or not, and I eventually gave up on them.

This was a shame, as at least one of them was a pretty nicely designed bit of plastic.

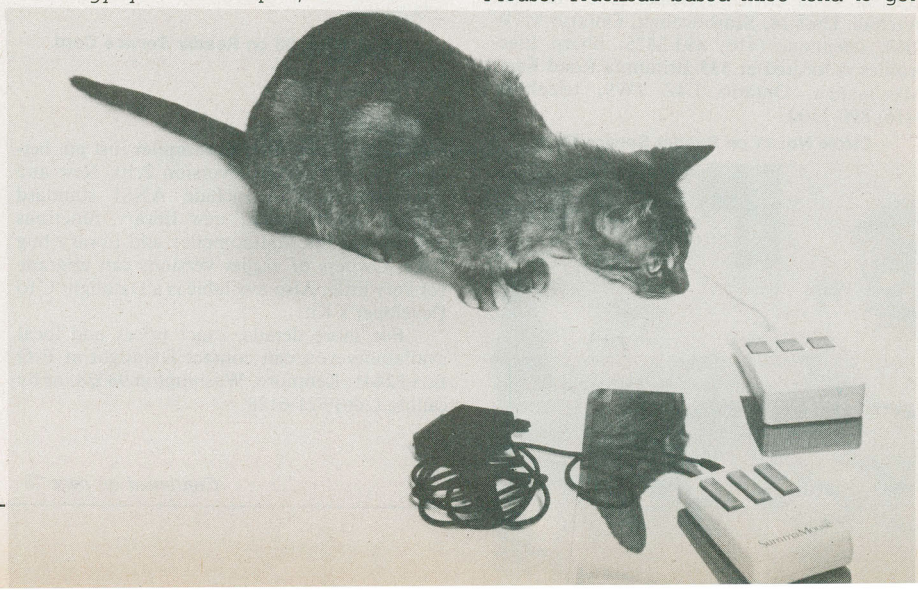
The two mice I eventually settled on as being too good to decide between were the Logimouse and SummaMouse. These two seemed to work with everything, came with lucid instructions, had workable software and didn't cost the earth and its immediate neighbouring planets. As I generally work with two PCs, I don't really have to narrow things down beyond this. However, each mouse had its own character... you can probably decide which of them is best suited to your needs if you've managed to get by with a single system thus far.

Summa Wrestling

The SummaMouse is actually the most unconventional mouse I encountered. The usual form of a mouse is to have a rolling rubber or metal ball under the thing which drives some internal rollers that, in turn, interrupt light emitting diodes to tell one's computer that the mouse is going for a stroll. The SummaMouse has left out a few things... most notably the trackball and all the moving bits.

The basis of the SummaMouse is a thick blue and silver cross hatched mouse pad, which it must move over if it's to do anything at all. This is, essentially, the circular interrupter of a traditional mouse flattened out. The light emitting diode that's usually inside a normal mouse shines out of the bottom of the SummaMouse, where its light can get reflected back up into the mouse by the silver areas of the pad. As such, rolling the mouse over the pad has much the same effect a rolling any other mouse over a hard, flat surface.

There are unquestionable advantages to this peculiar arrangement. To begin with, there are no moving parts in the SummaMouse. Trackball based mice tend to get



foot fungus problems quite quickly... their internal rollers acquire layers of dust and grease and become erratic, necessitating that they be taken apart and cleaned from time to time. Lacking these mechanical bits, the SummaMouse doesn't require periodic hosings out.

Even really good mice will prove to be a bit discerning about where they'll roll. For example, it's hard to get most mice to track reliably over shiny arborite desk tops... they slide around a bit. To this end, many people who use trackball mice use special rubber mouse pads... the SummaMouse, of course, comes with one whether you want it or not.

There are a few drawbacks to the SummaMouse at the hardware level. The pad is a double edged sword... lose it or forget to take it along with your mouse and you'll quickly find yourself back to zapping the cursor keys. The pad is generously large... which is a drag if you live in a small world of tightly cluttered tables. I find, in using the Mac, that I can get by with a quarter of the space the Summa pad wants if I'm too lazy to clean off my desk. The Summa pad has a big footprint.

Finally, the Summa pad has its own power supply and gets a bit warm once it's been on for a while. The power supply is only a problem because it ties up a plug... if you have one of those deluxe power bars with about ten outlets on it this wouldn't really concern you.

With the addition of the SummaMouse I think I've taken cube tap technology to its theoretical limits.

The body of the SummaMouse fits nicely in most human hands... something which was not true of many of the mice I tried. Its switches are second to none... they're big and emit nice, positive clicks when you belt 'em. The electronic mouse pad makes the SummaMouse the most accurate rat of the group. One's cursor tracks the movement of one's hand just perfectly.

The SummaMouse software was also rather unique. Far from simply being a mouse driver, the stuff that comes with the Summa system can change the way one uses one's PC... if one wants to let it.

The basic mouse driver for the SummaMouse allows the thing to be run through either of the two primary COM ports. It's unfortunate that they couldn't have allowed it to run with one of the secondary ports... I've managed to occupy the other two quite well even without a mouse.

As with the Logimouse, which we'll check out in a moment, the SummaMouse comes with a fairly small and, for many purposes, useless device driver. Unless the application you're planning to mouse with will talk to this thing directly, it will want to be set up by a much larger chuck of code, SM.EXE, which, in turn, will want to see a small configuration file. While SM avails one of other benefits, which we'll get to momentarily, it takes up a considerable chunk of overhead on a floppy disk.

The SM program is actually "Summa Menus". Having run it, the system will behave normally but the centre button of the mouse will call up a reversed out menu bar at the top of the screen. Having activated this, one can pull down the menus it provides and have this resident troll spew characters into one's application.

The menu program is a sort of glorified ProKey. All it really does, having had a menu item selected, is to "type" a predetermined string of characters in from what will look, to any program running on the PC, like the keyboard. The menus are surprisingly easy to set up... you can create a completely customized menu structure to work with any application you feel like running the mouse with. The menus don't interfere with the cursor positioning function of the mouse.

One could create a menu driven version of WordStar this way, for example. Actually, in a practical sense WordStar isn't a good choice, for reasons we'll get to. However, one can see how the system would work in looking at it. If one had a menu item that said "save and resume", for example, when it was selected it would type the characters control K, S, control Q and P... which is what one would type from the keyboard to initiate this function.

The menus are highly neat, although they do have a few drawbacks. For one thing, they tie up two of the mouse buttons. More importantly, they only work in text based applications. They were slick in BASIC, DOS, WordStar and so on. They did get very, very confused if they were called for in the middle of a program that had the screen in the graphics mode. For example, Personal Composer or AutoCAD are not really suitable for use with the menus... although both worked well with the mouse as a pointing device.

I really like the SummaMouse. It's not all that expensive, innovative and it works really well. I wasn't terribly taken by the menus, but I think that's my own headspace... I don't like keyboard macros that much either. The menus are really well done, and, besides which, they seem to come with the mouse whether you ask for 'em or not.

Exact Vulcan Logic

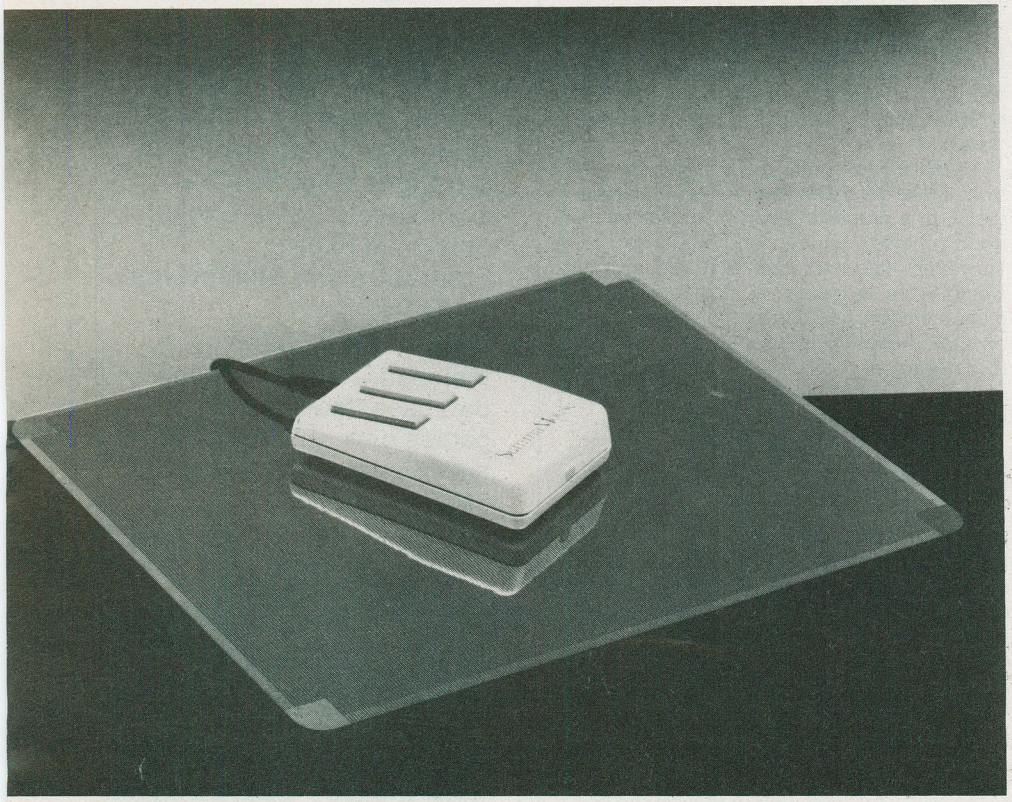
The C7 Logimouse is a much more traditional plastic rodent. It has a rubber trackball, three switches and a long white tail that snakes out behind the PC. It comes in a box which displays it wearing big black ears and calls it "America's next favourite mouse". Actually, "favourite" is spelled without the "u" in this case, attesting to its ancestry.

This isn't as offensive as it sounds. The Logimouse doesn't really have black ears on it and you can throw the box away as soon as you extract the mouse from it.

The Logimouse is one of the simplest mice to get up and running, at least from a hardware point of view. It needs no power supply, no interface cards, no special pads and no cables other than the one that it

comes with. It just plugs into either primary serial port of one's PC and sits there.

Like the SummaMouse, the Logimouse is very comfortable to hold and has fat, easily located switches that have a chunky, positive feel to them. It rolls easily over most surfaces, but, like most mice, it does best on a proper mouse pad. Actually, it liked the SummaMouse pad, which I would have thought was a bit slick for a mechanical



mouse. It didn't want anything to do with really shiny surfaces after it had collected a bit of navel lint and, like most mice when they're exposed to the sort of environment one finds in an old house in midst of summer, it required periodic cleaning.

For those that live in air conditioned condos, your typical old house in summer is a bit dusty, quite humid and rather hot. None of the mechanical mice I tried lasted very long under these circumstances... all of them required that their trackballs be removed and dusted off from time to time. The Logimouse was about average in its tolerance to dust. If the dog walked in and shook itself all the mice stopped working shortly thereafter.

One of the real dangers of reviewing a lot of mice under conditions such as these is that one will unthinkingly write something like "mice don't work well if their balls get dusty". While true, such a phrase could be misinterpreted.

The software for the Logimouse is, again, a basic device driver to make it look something like a Microsoft mouse to one's software, followed by a rich assortment of bells, whistles and bassoons. The usual approach to setting up the mouse is with a program called SETM.

The SETM program is invoked with a batch file, SETMOUSE, which will install the device driver and boot up SETM. If SETM is given an argument, such as "WORDSTAR", it will attempt to find a configuration setting called WORDSTAR and program the mouse driver accordingly. We'll get to that in a moment. If it isn't given an argument, it will bring up a really rather slick menu driven utility to allow one to create configuration settings.

Under the SETM menu one can program the four "keys" sent back by the trackball and the three that are generated by the buttons. Unlike as with the SummaMouse and its menu function, one can use all three buttons of the Logimouse for whatever one wants to have them do.

The buttons can be loaded with multiple character strings. You could have the right button print your post code, for example, if you have a hard time remembering it. More practically, it might hold the control codes to move down a page in your pet word processor.

One of the really slick aspects of setting up the Logimouse is that you can adjust its speed. Normally the mouse sends back two hundred "reports" for every inch you move the mouse. One could have the device driver send out two hundred cursor movement codes in response to this, but it would make the mouse pretty useless, zapping the cursor all over the screen with the slightest quiver of the mouse. As such, the driver divides the report rate by a constant value to determine the "speed" of the cursor relative to the speed of the mouse.

Most of the mouse systems I tried had their speeds fixed at values which were reasonable for most applications. The Logimouse allows one to not only adjust the speed for each configuration, but also to independently set the horizontal and vertical speed values. This makes an enormous difference in the use of the mouse, as it can really be set up to match the programs it's going to be used with.

This configuration utility is really slick once you get it all set up with configuration tables for your software. You can subsequently invoke it from DOS with a command line argument to have it set up the mouse for whatever you are going to use next. As such, one might have separate configurations of the mouse for BASIC, WordStar, Lotus, AutoCAD and so on, and call SETM to tell the mouse what to be whenever one was about to boot a program. With a bit of forethought, once could even set up batch files to get this together automatically.

The only drag about this system is that it, like the one for SummaMouse, takes a lot of disk overhead. It also takes a while to get its act together when it's booted to change a configuration table... perhaps not surprisingly, being almost ninety kilobytes of code. Neither of these problems is noticeable on a hard drive system... both are a pain on floppies.

That Logimouse was the best of the trackball mice I tried. Its operation was faultless, it felt smooth and behaved predictably. I think that what impressed me the most about it was the amount of support that its creators seem to offer people who want to write programs for it. There are bits of C and Modula code on its disk to help one get it hooked into custom software, a huge text file that talks about working with it from programs. There's also a lot of clever BASIC stuff in there.

Mouse Traps

There are a number of things that are worth noting about PC mice in general, and these two in particular.

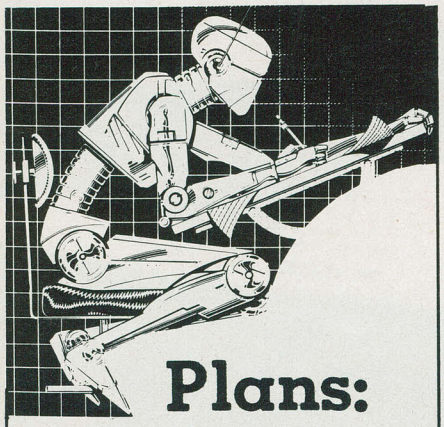
First of all, not all PC compatibles are compatible with all mice. In fact, some of the funkier street level BIOSs that one finds in some of the less expensive PCs are positively phobic about 'em. One of the systems I tried several of the mice on had a SuperBIOS... and it managed to disagree with just about all of them for one reason or another. A Phoenix BIOS, or something equally a

well written, is almost essential if you plan to use a mouse with a PC compatible.

The software for the Macintosh was all written with a mouse in mind, and, as such, it behaves very nicely with one. The PC's software, for the most part, was never intended to use a mouse and, not surprisingly, some of it doesn't want to.

Menu programs, even pretty good ones like the Summa package, don't quite turn one's PC into a Mac. The menus are still a bit awkward, and the cursor won't behave in quite the way you'd think it would. It takes a lot more practice to be able to mouse one's cursor over to where one wants it on a PC than it does on a Mac. You'll find that the thing will hop from line to line, dither about where it wants to land and so on... this is a limitation of the PC that the best mice can't wholly overcome.

Some software just isn't destined to be mouse driven. WordStar is a good example of this. It will listen to the mouse without any complaints, but it's a llama's feedbag to actually use. The keyboard input routine of WordStar is just too slow to accept characters at the rate the mouse can spit them out. The cursor takes a long time to show up where one sends it. The whole effort is just about useless on a stock PC, a bit better on a higher speed system and approaches something workable on an AT.



Plans:

Hardware: **SummaMouse**
Manufacturer: **Summagraphics Corporation, 777 State Street Ext., Fairfield, Connecticut 06430, (203) 384-1344**
Price: **$119.00 US**

Hardware: **Logimouse**
Manufacturer: **Logitech**
Availability: **Sterling Micro Systems, 1650A West 8th Ave., Vancouver, B.C. V6J 1V4, (604) 732-3967**
Price: **$195.00**

Other software fares a lot better. AutoCAD, for example, is a delight with a mouse. Personal Composer... which is what I originally started questing after for a mouse for... just sails along. Lotus seems to be very tight with mice, although I haven't much rapport with spreadsheets and I'm not really tight with the nuances of their use.

Depending on what you're doing, either of these mice can greatly speed up your communications with your computer. Actually, you'll probably be surprised just how easy it is to get used to the action of a mouse... and how much of a drag it is when you're at work and your mouse is languishing, unavailable, on your system at home. A mouse can be a powerful asset.

Of course, you'll have to clean off part of your desk. This is, arguably, the only meaningful drawback.

CN!

Amiga Peripherals

This is just a sampling of the goodies available for the Commodore Amiga... old classics that have been converted and some brand spanking new things designed specifically to take advantage of the Amiga's nifty colour and sound capabilities. In fact, some of these things are so new their Canadian prices haven't even been set yet, so check out the Amiga dealer closest to you.

by CN! Staff

Amiga Peripherals

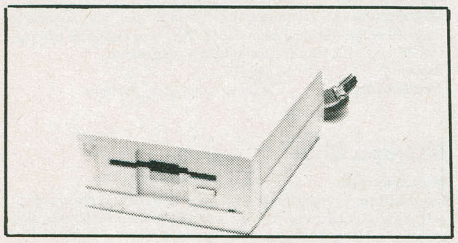
Hardware:

Amiga Monitor (1080)

Manufacturer: Commodore
Description: Colour monitor designed to display all 4,096 colours available to the Amiga.
Price: $799.99
Availability: Authorized Amiga dealers

External Disk Drive (1010)

Manufacturer: Commodore
Description: Microfloppy drive, 3.5 inches, double-sided, double-density, 880K formatted storage capacity.
Price: $449.00
Availability: Authorized Amiga dealers

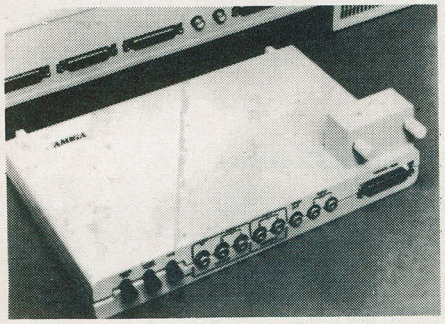


External Disk Drive (1020)

Manufacturer: Commodore
Description: Standard floppy drive, 5 1/4 inches, double sided, double density, 360K formatted storage capacity; supports IBM PC read/write formats.
Price: $599.00
Availability: Authorized Amiga dealers

Amiga Genlock 1300

Manufacturer: Commodore
Description: Allows text, sound and graphics created by the Amiga to be combined with any NTSC source such as a VTR, camera, television or other computer; available in Canada late summer.
Price: About $500
Availability: Authorized Amiga dealers



Amiga Sidecar

Manufacturer: Commodore
Description: An IBM PC hardware emulator, to be available in the fall.
Price: T.B.A
Availability: Authorized Amiga dealers

Digi-View

Manufacturer: Digi-View
Description: A video digitizer, allows display of broadcast-quality colour photographs, or high-res monochrome.
Price: $339.00
Availability: Authorized Amiga dealers

Memory Expansion Cartridge (A1050)

Manufacturer: Commodore
Description: Provides 256K additional memory, with no switch setting necessary.
Price: $299.99
Availability: Authorized Amiga dealers

Memory Expansion

Manufacturer: Cardco
Description: One megabyte memory expansion board.
Price: $799.95
Availability: Beamscope
Price: $119.95
Availability: Authorized Amiga dealers

Comspec AX 2000

Manufacturer: Comspec Communications
Description: Two megabyte RAM board, allowing cascading of additional AX 2000s.
Price: $1,276.00
Availability: Comspec Communications

Tecmar T-connect

Manufacturer: Tecmar
Description: Expansion module, plugging into Amiga bus.
Price: $733.00
Availability: EMJ

Tecmar T-card

Manufacturer: Tecmar
Description: Multifunction module including serial port, clock/calendar, hard disk interface and up to 1 M of RAM.
Price: $1,295.00
Availability: EMJ

Modem 1200 RS

Manufacturer: Commodore
Description: A direct connect, 300/1200 bps modem with RS-232C interface, and featuring Hayes command protocol.
Price: T.B.A.
Availability: Authorized Amiga dealers

Penmouse

Manufacturer: Kurta
Description: A graphics tablet input device consisting of a cordless, battery-powered pen and a thin tablet.
Price: $549.95
Availability: Authorized Amiga dealers

Series ONE

Manufacturer: Kurta
Description: Graphics tablet, with built-in power supply, in three sizes.
Price: $895 to $1,595
Availability: Authorized Amiga dealers

Easyl

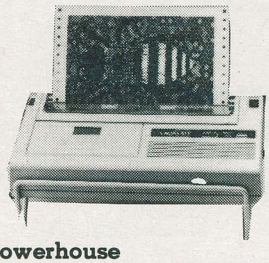
Manufacturer: Anakin Research
Description: Graphics tablet featuring 1024 x 1024 pixel resolution; use with Graphicraft, Aegis Images, Deluxe Paint and others.
Price: $699.00
Availability: Anakin Research

Canon PJ-1080A

Manufacturer: Canon
Description: Colour inkjet printer, 37 cps.
Price: $995.00 (list)
Availability: Authorized Canon dealers

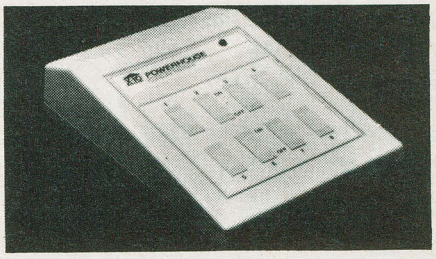
Okimate 20

Manufacturer: Okidata
Description: Colour thermal printer, printing over one hundred colours; includes Plug 'N Print module for interface.
Price: $410.00 (list)
Availability: CDI Computer Distribution



X-10 Powerhouse

Manufacturer: X-10 Home Controls
Description: A computer interface which can automatically control virtually all electrical appliances in or around the home or office.
Price: T.B.A.
Availability: X-10 Home Controls



Hippo EPROM Burner

Manufacturer: Hippopotamus
Description: Reads, verifies, edits and burns most EPROM chips.
Price: $199.95 U.S.
Availability: Authorized Amiga dealers

FutureSound

Manufacturer: Applied Visions
Description: Digital sound recorder system, including recorder, cables, microphones, software.
Price: $329.95
Availability: Authorized Amiga dealers

PAL

Manufacturer: Byte by Byte
Description: Turnkey external expansion chassis, with one to eight megabyte RAM card options.
Price: N/A
Availability: Authorized Amiga dealers

Software:

Amiga Transformer

Manufacturer: Commodore
Description: Allows the Amiga to run many MS-DOS business packages.
Price: $149.99
Availability: Authorized Amiga dealers

Amiga C

Manufacturer: Commodore
Description: C language program.
Price: $229.00
Availability: Authorized Amiga dealers

TDI Modula-2

Manufacturer: TDI
Description: Complete 68000 development language, creating 32 bit code; includes full screen editor with error finding capability.
Price: $119.95
Availability: Authorized Amiga dealers

dBC III Library

Manufacturer: Lattice
Description: Over seventy C functions which are compatible with dBASE III.
Price: $210.00 (list)
Availability: Software Commodities

Lattice C Compiler

Manufacturer: Lattice
Description: Full implementation of K & R, with the ANSI C extensions.
Price: $211.95
Availability: Ingram

Lattice Amiga C Cross Compiler

Manufacturer: Lattice
Description: Allows Amiga developement of MS-DOS system; includes C compiler.
Price: $250 US
Availability: Authorized Amiga dealers

LMK (Lattice Make Utility)

Manufacturer: Lattice
Description: Automated product generation utility compatible with Unix Make.
Price: $176.95
Availability: Ingram

Amiga Peripherals

Lattice Screen Editor (LSE)

Manufacturer: Lattice
Description: Programmer's editor, multi-window environment.
Price: $141.95
Availability: Ingram

Lattice Text Utilities (LTU)

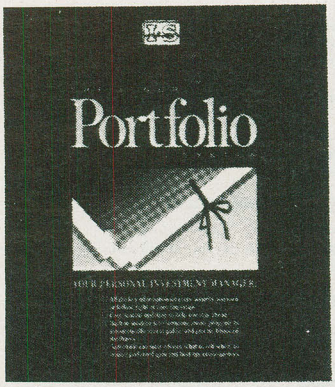
Manufacturer: Lattice
Description: Eight software tools to help manage text files.
Price: $105.95
Availability: Ingram

Panel

Manufacturer: Lattice
Description: Allows layering of screen designs with up to ten overlapping images; will output C source.
Price: $299.95
Availability: Authorized Amiga dealers

Isgur Portfolio

Manufacturer: Batteries Included
Description: Compiles and manages information needed for investment decisions; built-in telecommunications facility is pre-set to access Dow Jones, CompuServe and The Source.
Price: $349.95
Availability: Beamscope



Maclibrary

Manufacturer: Lattice
Description: Functionally compatible with most Macintosh Quickdraw routines
Price: $140.00
Availability: Authorized Amiga dealers

Live!

Manufacturer: A-Squared
Description: Can be connected to a video camera to display, manipulate and store digitized images; approximately 320 pixels per video line.
Price: T.B.A.
Availability: Authorized Amiga dealers

PaperClip Elite

Manufacturer: Batteries Included
Description: Advanced word processor with GEM user interface, real-time spelling checker and idea-processing capabilities; integrates text and graphics, and is compatible with most other word processors.
Price: T.B.A.
Availability: Beamscope

Analyze!

Manufacturer: Micro-Systems Software
Description: Electronic spreadsheet allowing cursor or mouse control.
Price: $139.95
Availability: Authorized Amiga dealers

Unicalc

Manufacturer: Lattice
Description: Electronic spreadsheet.
Price: $110.00 (list)
Availability: Software Commodities

MaxiPlan

Manufacturer: MaxiSoft
Description: Spreadsheet providing what-if analysis with numerical data, with output in various chart modes.
Price: T.B.A.
Availability: Beamscope

Logistix

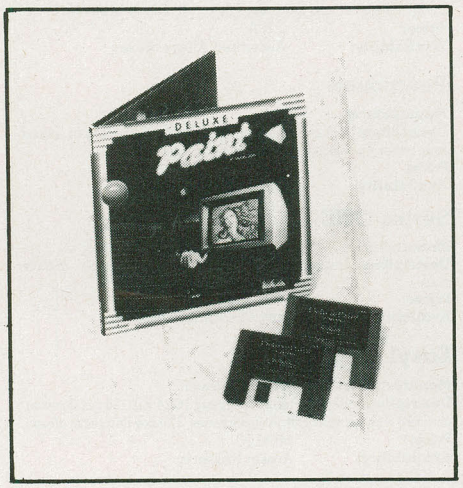
Manufacturer: Grafox
Description: Spreadsheet, including database management, timesheet and graphics capabilities.
Price: $399.95
Availability: Authorized Amiga dealers

Amiga Graphicraft

Manufacturer: Commodore
Description: Entry level graphics and design program.
Price: $149.99
Availability: Authorized Amiga dealers

Deluxe Paint

Manufacturer: Electronic Arts
Description: Includes zoom enlarging, independent split-screen zooming, independent multiple scrolling.
Price: $139.95
Availability: Beamscope



Deluxe Video Construction Kit

Manufacturer: Electronic Arts
Description: Produces video slide shows, animation, interactive educational videos.
Price: $139.95
Availability: Beamscope

Aegis Images

Manufacturer: Aegis Development
Description: A professional paint system, suitable for architectural, theatrical, advertising or other graphic work; accepts video images from Genlock.
Price: $79.95 U.S.
Availability: Authorized Amiga dealers

Aegis Animator

Manufacturer: Aegis Development
Description: Full-featured metamorphic animation system, supporting 3D manipulation of objects; accepts paintings from Aegis Images, and Amiga Graficraft; use with Genlock for video titles, scrolling credits.
Price: $139.95 U.S.
Availability: Authorized Amiga dealers

Art Pak 1 and 2

Manufacturer: Aegis Development
Description: Ready-to-use clip art collections for use with any paint or animation system.
Price: $59.95 U.S.
Availability: Authorized Amiga dealers

Degas Elite

Manufacturer: Batteries Included
Description: Professional graphics program with desktop publishing capabilities.
Price: $79.95
Availability: Beamscope

Dynamic CAD

Manufacturer: Microllusions
Description: Advanced, 2D drafting system with isometric capabilities.
Price: $799.95
Availability: Authorized Amiga dealers

LogicWorks

Manufacturer: Capilano Computing
Description: An integrated logic design tool with schematic diagram entry and simulation capabilities, user-definable macros, PROM and PLA support and interactive operation.
Price: $249.95
Availability: Capilano Computing Systems

B/Graph Elite

Manufacturer: Batteries Included
Description: Complete business graphics including pie charts, 1 and 2 dimensional bar charts, line and area graphs; includes statistical analysis package.
Price: $69.95
Availability: Beamscope

Farm Accountant

Manufacturer: Digipac
Description: Double entry general ledger specifically for farming; does analysis of income of expenses, and stores up to 1,500 transactions per month.
Price: $295.00
Availability: Digipac

Farm Financial Analysis

Manufacturer: Digipac
Description: Budgeting, profit/loss, cash flow, tax forecast, capital cost allowances; imports/exports spreadsheet data. Inventory and Filer also available.
Price: $99.00 each
Availability: Digipac

Financial Cookbook

Manufacturer: Electronic Arts
Description: Spreadsheet, calculator and investment advisor.
Price: $69.95
Availability: Beamscope

I.S. Time and Billing

Manufacturer: Integrated Solutions
Description: Office management and billing program, featuring GEM user interface.
Price: T.B.A.
Availability: Beamscope

Rags to Riches IV

Manufacturer: Chang Labs
Description: Accounts receivable/payable, general ledger; handles up to 5,000 accounts, 10,000 transactions; compatible with workbench conventions, supports mouse, icons, multitasking.
Price: $499.50 U.S. full package ($199.95 U.S. each)
Availability: Authorized Amiga dealers

Amiga Textcraft

Manufacturer: Commodore
Description: Entry level word processing package; also available with ready-made business forms.
Price: $189.99
Availability: Authorized Amiga dealers

AMIGA™
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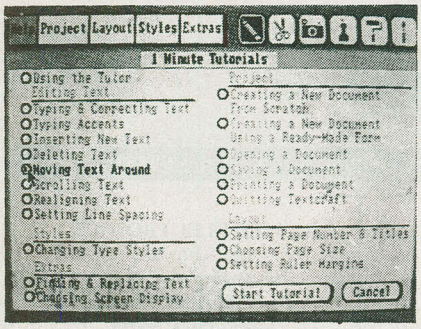
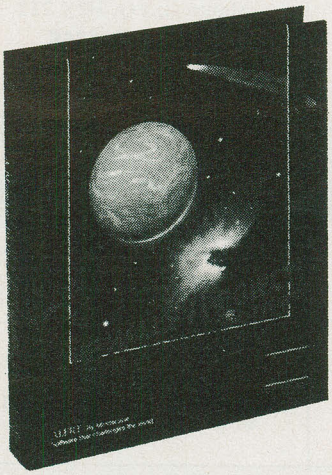


HippoConcept

Manufacturer: Hippopotamus Software
Description: Multi-level outliner and idea processor.
Price: $119.95 U.S.
Availability: Authorized Amiga dealers

The Halley Project

Manufacturer: Mindscape
Description: Educational game: secret mission through our solar system.
Price: $49.95
Availability: Beamscope



Keyboard Cadet

Manufacturer: Mindscape
Description: Teaches touch typing, either QWERTY or Dvorak keyboard.
Price: $44.95
Availability: Beamscope

MaxiDesk

Manufacturer: MaxiSoft
Description: A set of useful business tools including calculator, alarm clock, phone book, keyboard helper and notepad.
Price: $99.95
Availability: Beamscope

Deluxe Print

Manufacturer: Electronic Arts
Description: Full-function colour printing program, featuring 15 formats for creating customized printouts in colour or black and white.
Price: $139.95
Availability: Beamscope

TDI Andra

Manufacturer: TDI
Description: Document processor for Epson FX-80 compatible and laser printers; graphic onscreen display of final copy.
Price: $149.95 ($749.95 laser version)
Availability: Authorized Amiga dealers

HippoWord

Manufacturer: Hippopotamus Software
Description: Advanced word processor including multiple font support, mail merge and macros.
Price: $89.95 U.S.
Availability: Authorized Amiga dealers

HippoFonts I

Manufacturer: Hippopotamus Software
Description: Set of 12 additional fonts for use with HippoWord.
Price: $59.95 U.S.
Availability: Authorized Amiga dealers

HippoSpell

Manufacturer: Hippopotamus Software
Description: Spell checker with 30,000 word dictionary.
Price: $59.95 U.S.
Availability: Authorized Amiga dealers

Zuma Fonts

Manufacturer: Zuma Group
Description: Three volumes, each containing 54 fonts, and The Font Librarian.
Price: $54.95 each
Availability: Authorized Amiga dealers

Amiga Term

Manufacturer: Commodore
Description: Terminal emulation and telecommunications package; supports Kermit, X-modem and CompuServe B protocols.
Price: T.B.A.
Availability: Authorized Amiga dealers

MaxiComm

Manufacturer: MaxiSoft
Description: Terminal and file transfer utility.
Price: $69.95
Availability: Beamscope

BBS-PC

Manufacturer: Micro-Systems Software
Description: Versatile electronic bulletin board system.
Price: $139.95
Availability: Authorized Amiga dealers

Diga!

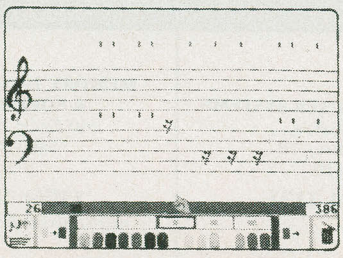
Manufacturer: Aegis Development
Description: Easy multi-tasking telecommunications package.
Price: $79.95 U.S.
Availability: Authorized Amiga

Musicraft

Manufacturer: Commodore
Description: Music/entertainment package.
Price: $149.99
Availability: Authorized Amiga dealers

Music Studio

Manufacturer: Activision
Description: MIDI software for the composition and editing of scores; includes library of compositions.
Price: $79.95
Availability: Beamscope



Instant Music

Manufacturer: Electronic Arts
Description: Using a mouse, you can "jam" along with your computer.
Price: About $64.00
Availability: Beamscope

Amiga LISP

Manufacturer: Commodore
Description: A symbol processing language used extensively in the field of artificial intelligence.
Price: $309.99
Availability: Authorized Amiga dealers

Amiga Assembler

Manufacturer: Commodore
Description: Provides a Motorola 68000 syntax micro-assembler for software development; includes linker, libraries, and include files.
Price: $309.99
Availability: Authorized Amiga dealers

Metacomco Macro Assembler

Manufacturer: Antic, Metacomco
Description: Complete development system featuring macros, formatted listings, conditional assembly; linker and full screen editor included.
Price: $79.95 U.S.
Availability: Authorized Amiga dealers

Amiga Pascal

Manufacturer: Commodore
Description: Full ISO 7185 standard Pascal single pass compiler.
Price: $309.99
Availability: Authorized Amiga dealers

Garry Kitchen's Gamemaker

Manufacturer: Activision
Description: Allows user to create animation, design player shapes, draw playing fields; creates arcade-style games.
Price: $69.95
Availability: Beamscope

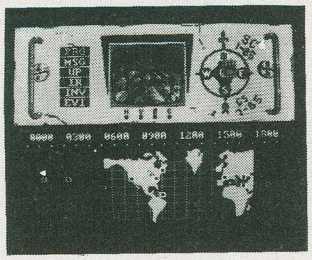
Racter

Manufacturer: Mindscape
Description: Game: discuss philosophy with your Amiga, which answers your questions out loud.
Price: $49.95
Availability: Beamscope

Amiga Peripherals

Hacker

Manufacturer: Activision
Description: Game: simulated computer network involving spies and stolen documents, and testing one's hacking skills.
Price: $59.95
Availability: Beamscope



Mindshadow

Manufacturer: Activision
Description: Game: an amnesiac searches for identity.
Price: $59.95
Availability: Beamscope

Mindwalker

Manufacturer: Commodore
Description: Game: a physics professor goes mad.
Price: $79.95
Availability: Authorized Amiga dealers

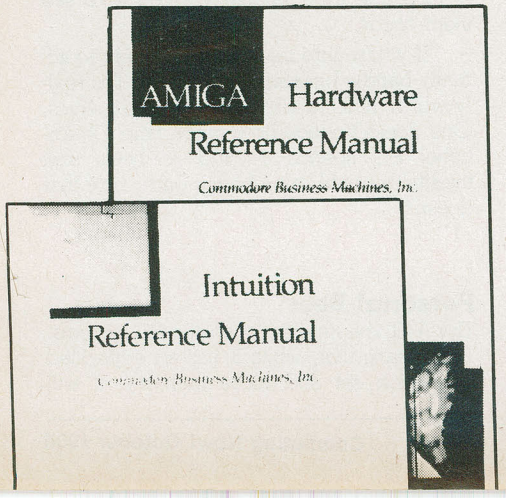
Leader Board

Manufacturer: Access Software
Description: Pro golf simulator featuring multiple 18 hole courses, three dimensional play and three levels of play. Joystick required.
Price: $59.95
Availability: Beamscope

Books:

Amiga Technical Reference series

Description: Written by the hardware designers and programmers of the Amiga.
Prices: Hardware Reference Manual $33.95
Intuition Reference Manual $33.95
ROM Kernel Ref. Manual: libraries & devices $52.75
ROM Kernel Ref. Manual: exec $37.75
Availability: Addison-Wesley



The Amiga Programmer's Reference Guide

Authors: Peck and Deyl
Description: An introduction to the Amiga for programmers familiar with C.
Price: $43.50
Availability: Collier Macmillan

The Amiga Programmer's Handbook

Author: Eugene Mortimore
Description: Details ROM-BIOS and Intuition calls, emphasizing the animation and graphics capabilities.
Price: $34.50
Availability: Collier Macmillan

Compute!'s Amiga Programmer's Guide

Authors: Editors of Compute! magazine
Description: Covers AmigaDOS, BASIC, Intuition and other important software tools.
Price: $24.50
Availability: McGraw-Hill Ryerson

Amiga Programming Guide

Author: T. Knight
Description: Focusses on the Amiga's special attributes, such as graphics and sound.
Price: $27.95
Availability: Firefly Books

Sources:

● Addison-Wesley Publishing, 26 Prince Andrew Place, P.O. Box 580, Don Mills, Ontario M3C 2T8, (416) 447-5101 ● Anakin Research, 100 Westmore Drive, Unit 11C, Rexdale, Ontario, M9V 5C3, (416) 744-4246 ● Beamscope, 128 Shorting Road, Scarborough, Ontario M1S 3S6, (416) 291-0000, toll-free in Canada 1-800-268-5535 ● Canon Canon, 6390 Dixie Road, Mississauga, Ontario L5T 1P7, (416) 678-2730 ● Capilano Computing Systems, P.O. Box 86971, North Vancouver, British Columbia V7L 4P6, (604) 669-6343 ● CDI Computer Distribution, 222 Yorkland Boulevard, Willowdale, Ontario M2J 1R5, (416) 495-1817 ● Collier Macmillan Canada, 539 Collier Macmillan Drive, Cambridge, Ontario N1R 5W9, (519) 621-2440 ● Commodore Business Machines, 3470 Pharmacy Avenue, Agincourt, Ontario M1W 3G3, (416) 494-9755 (call for nearest dealer) ● Comspec Communications, 153 Bridgeland Avenue, Unit 5, Toronto, Ontario M6A 2Y6, (416) 787-0617 ● Digipac, 907 River Street East, Prince Albert, Saskatchewan S6V 0B3, (306) 764-1707 ● EMI Data Systems, 291 Woodlawn Road, West, 3, Guelph, Ontario N1H 7L6, (519) 837-2444, in Toronto area (416) 454-2940 ● Firefly Books, 3529 Pharmacy Avenue, Unit 1-C, Scarborough, Ontario M1W 2T8, (416) 499-8412 ● Ingram, 40 A Adesso Drive, Concord, Ontario L4K 2Y1, (416) 738-1700 ● McGraw-Hill Ryerson, 330 Progress Avenue, Scarborough, Ontario M1P 2Z5, (416) 293-1911 ● X-10 Home Controls, 1200 Aerowood Drive, Unit 20, Mississauga, Ontario L4W 2S7, (416) 624-4446

The Best AVT 286 Review

The Best AVT is a very unexciting AT compatible... it lacks the breathtaking splendour of hard drive crashes, the wonder of catastrophic software incompatibility and the visual splendour of power supply detonations. If you can live without these things, however, it's a surprisingly good computer for a surprisingly low price.

by Steve Rimmer

After a while it starts to get difficult to become excited over yet another new PC. There are rather a lot of them appearing just at the moment... everyone seems to have worked up to an AT of some sort... and after a while they all look more or less the same.

I was very impressed with the real IBM PC/AT when it appeared, and I have quite liked a few of the compatibles. However, in the blind foaming rush to get their respective acts together a number of the computer manufacturers have created systems which look like ATs, feel like ATs, have all the slots, memory and I/O of ATs... and work like pigs. A great many of the compatibles aren't.

Having gotten generally turned off the whole idea of low budget ATs, I was quite surprised at the AVT 286, which is anything but another cheap and nasty AT knock off. In fact, once you get into it, the AVT looks like quite the system. In fact, in totally ruins you for a miserable 8088 based system.

Try it at your own risk.

Chip Of The Gods

There are a number of things which one can say about the usual PC compatible systems that most of us poor people work with. They're inexpensive, yes, but they're also a bit short on luxuries. They're painfully slow, for one thing, and limited to six hundred and forty kilobytes of RAM. This used to be a lot of memory, but times have changed and it has become remarkably easy to fill well over half a megabyte without really trying.

The AT... whether it's a real one or a compatible, such as the AVT we'll be checking out here... has a number of things going for it over a PC or XT system. The most important bit is its processor, a really weird looking square chip called an 80286, and its attendant math coprocessor, the 80287. This little beast is fast, blindingly so as compared to the older 8088 that formed the basis of the first generation IBM PC systems.

The AVT runs at the sorts of speeds that computers should clip along at. Really slow programs, like WordStar and AutoCAD, take on new life when they're run on an AVT. Its screen updates much faster than any PC ever could... the difference in the way software runs on it has to be experienced.

The other advantage of the AVT over earlier PC compatibles is its ability to handle extra memory. Now, this is a bit tricky. It would be really handy to be able to simply tack some additional RAM onto the system's memory bus starting at six hundred and forty K, so that the new RAM would be contiguous with the existing bits. However, because of a rather poor bit of design in the original PC this isn't really all that possible. In order to keep the AVT compatible with software for the existing PCs, its additional memory had to go somewhere else.

The AVT can support up to sixteen megabytes of extra RAM, which lives above the BIOS. In fact, the IBM standard parity check system "suggests" a limit of four. While this can't really be used as primary memory to hold programs under MS-DOS 3.1, it can do quite a lot of other things. It can, for example, become the RAM disk of the gods. It will also hold some resident utilities, keeping them out of the way down in regular memory. Finally, it can be used to stash data in. It's extremely attractive for the use of huge spreadsheets... four megs will hold a lot of cells and formulae.

Another interesting aspect of the AVT is its disk drive allotment. Its second drive is a normal double sided, double density floppy, although it's grey, rather than black. I think this is intended to confuse someone, although its unclear as to whom. The primary drive can support either the usual three hundred and sixty kilobytes of a normal PC's disks or well over a megabyte in a new high density standard. The quad density disks that it wants to run with are a bit expensive, but people who have come to loath the disk limitations of the PC probably won't mind this.

The AVT I got to play with came stuffed out with two floppies and a twenty megabyte hard disk. An AVT with a hard disk is a cosmic experience... anything less is a four function pocket calculator with failing batteries. In an extreme example, one of my really huge C programs takes about twenty-five minutes to do a complete recompilation on a floppy based PC and about four minutes running on the hard drive AVT. Smaller efforts happen before you fully form the thought that you'd like to see them occur.

If you're into business computers to actually handle business with, the AVT is really worth thinking about for the time it saves. One doesn't notice how much time a traditional PC spends cooling its heels and meditating until one checks out a box that doesn't.

Personal Best

The AVT is a superset of earlier PC systems. This means that, while it has an expanded instruction set and more memory, it will

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cheerfully run the huge library of software that already exists for the IBM PC. It'll just do it in a shorter time.

The usual applications all run fine on the AVT. WordStar running under its auspices is a brand new package, imbued with a life and vigor it hasn't seen since it ran on eight bit systems back in the early days of pre-civilization. Things written in dBASE trot along nicely... AutoCAD is absolutely glorious. I plugged my Hercules card into the system and tried Personal Composer on it... this was a hoot. Huge clumps of music compiled instantly and the screen updates zipped along like lightning.

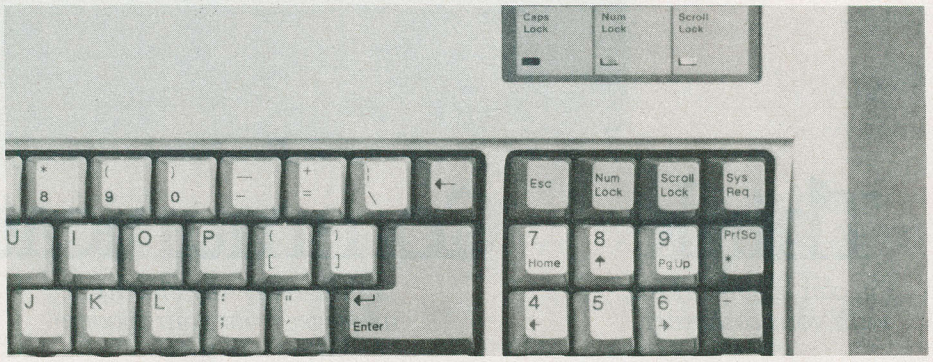
The system did bomb on a couple of the more severe compatibility tests. For example, it did not like the original Microsoft flight simulator, a sort of standard nasty to throw at compatible machines. It got into the first screen but crashed thereafter. However, the actual usefulness of this program is questionable unless you really want to learn to fly phosphor airplanes. Later versions of the simulator worked properly.

There is a lesser problem with quite a few other games on the AVT. It will run most of the game software one encounters, with the exception of a few of the more rigorously copy protected affairs that won't run on anything but an authentic IBM... and then only if you talk to 'em real nice. However, some of the less intelligently written games use timing loops to determine how fast things will go. With its ability to execute instructions quite a few times faster than a normal PC, the AVT runs these things by at blinding speeds, far beyond the scope of mere mortals to play.

I wrote an experimental AVT slow down program to solve this little inconvenience... it hooked into the clock interrupt and wasted time. This brought the system back down to sub light speed to allow speed sensitive software to think it was running in a regular PC. This may be regarded as a bit convoluted if your primary interest is in games, of course.

A lot of the software compatibility of the AVT is owed to its Phoenix BIOS, a specially written 80286 version. This features, among other things, a really fast memory test which can be killed with a keystroke if you're in a real lather. It also has about the best video routines I've encountered... the colour card screen scrolls without a noticeable amount of flicker or snow.

As with its software, the AVT is largely happy with most reasonable PC expansion cards. It has seven slots, of which two are regular old PC type connectors and five have AT extensions. We'll get to that in a second. On the system I got one of the PC



slots was stuffed with a regular Multiflex video card and two of the AT ones contained the disk controllers. The rest of the space was free.

The AT slots are, again, a superset of what one might find in a PC. They consist of regular PC connectors with smaller extra slot connecters tacked on. These secondary slots carry the address lines for the extra four megabytes of RAM space. Cards that don't have any need to access this space can ignore these slots. As such, the system is compatible with existing PC cards.

Bugs In The System

Legend has it that the earliest computers were plagued with real bugs... moths would get in between the contacts of their relays and stop them from working, hence the origin of the term. This sort of thing was thought to have gone away with the demise of relay based computers. Well, I found a bug in the AVT.

After several weeks of screaming along without so much as a hiccup, the AVT refused to boot one morning. Like all ATs, it has a bit of battery backed up memory which holds its configuration parameters... what sort of disks and memory it has, the type of colour card it's supposed to be using, what the time and the date are and so on. If this information isn't right it won't bring its hard drive up, but, rather, will ask to be set up from scratch using a floppy disk.

The set up procedure isn't very involved, but, in this case, it didn't work. Rebooting the system brought up the same error.

Now, ATs of all sorts are a bit hard on their batteries and when the batteries croak things get unpleasant. Upon pulling the AVT's batteries, however, I discovered that they were not dead, but merely resting. There was an ant crushed between them. It had gotten very humid, and I suppose that the ant had expanded just enough to break the contact between the two batteries.

This was, in fact, the only meaningful glitch in the system in the whole time I was working with it. You probably won't encounter a similar problem as, in most cases, one has to install the batteries in an AVT one's self, and one can take care to fend off insects during the course of the procedure.

The construction of the AVT is first rate. It's a big beast, larger than a conventional PC case, and quite heavy. This makes it a drag to move around but a very solid box that won't twist and pop the plate throughs out of its motherboard. The motherboard itself looks really nicely done, without any flying jumpers or parts dangling from the pins of chips. The power supply is a gargantuan black brick that should easily power a fully stuffed AVT and a couple of hard drives without getting erratic. I couldn't actually find a wattage rating on it, but it's the biggest supply I've yet encountered.

The whole effort is, of course, locally made... complete with a local service department so that, if the system does do something unusual, it won't have to be sent back to Taiwan, Korea or Mars. This is a worthwhile consideration, to be sure... some of the service facilities that accompany low cost systems are non-existent.

The AVT is what the PCs really should have been at about the price they should have been sold for. It's the singularly nicest machine I've yet had an extensive play with, and is wholly impressive. While it is, on the surface, just a faster PC, its combination of facilities makes it completely different system in practice. Things that just don't work in real time on a PC are eminently practical on the AVT.

If you really can't afford one, don't ever try one out. It will make you very, very sad indeed. **CN!**

Almost Free PC Software

Volume XIV

Cosmic Enlightenment on a Floppy Disk

The public domain was unusually generous when we were compiling this disk of software. We've assembled the best of what we found, all of it carefully tested, debugged, played with and trolled for worm killers, buried gremlins and other nasties. These programs will keep your computer happy for nanoseconds on end, and will do in your head for considerably longer.

Cut and Paste is a memory resident program that allows you to grab text from the screen of any application and paste it into any other application that accepts characters for input. You could, for example, copy part of a Lotus spreadsheet and paste it into a WordStar document.

INT13 will help you unravel the copy protection schemes of your software so you can make archive copies... just in case the cat takes a fancy to your masters. It prints a log of direct disk accesses and where they're called from so you can check out the code that's going after specific tracks, the heart of most protection systems. Includes the assembler source code.

PMAP tells you what's living in the memory of your system and where it's at. It will help you to find the resident utilities you have loaded and, more important, is great for sorting out peculiar interactions between multiple resident programs.

SoftTouch is a keyboard macro program not unlike ProKey. It allows you to store up to twenty-five thousand key strokes, has a built in screen blanker and great wandering herds of other features.

Sub Chase is a first rate graphics arcade game. One sails across the clear blue sea... or green sea, depending on what sort of monitor you have... heaving depth charges off the stern to blow up subs. It's a lovely bit of carnage, and it has a panic button to clear the screen should the boss walk in. Requires a colour graphics card.

The Draw is an ANSI screen editor. It allows you to create and edit full colour screens of text and graphics which can subsequently be typed to make them appear... in full colour... or integrated into programs. It's a supremely brilliant program, and more fun than a baboon with a box of plastic bananas. Requires DOS two or better, ANSI.SYS and is more fun with a colour monitor.

Trek is the best Star Trek game anyone has yet devised for the PC. The graphics are stunning, the complexity is intense and the action scoots along at warp nine as soon as the program gets going. Requires a colour card.

Crossword is a utility to translate text files from one application to another. It covers several of the more popular word processors, including WordStar, WordStar 2000, Multimate, XYwrite, SideKick and straight ASCII. It saves ages worth of reformatting and does some useful things besides.

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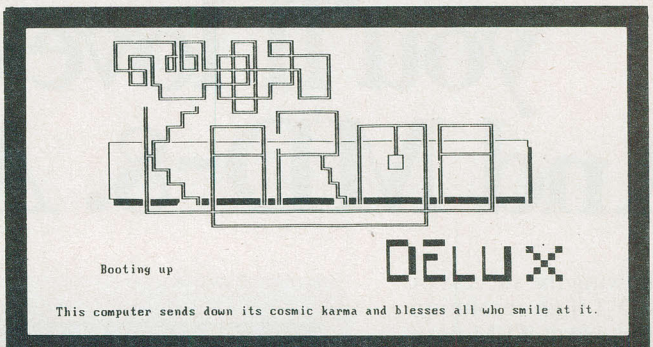

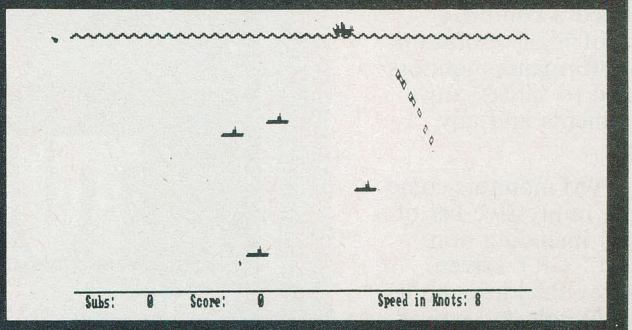

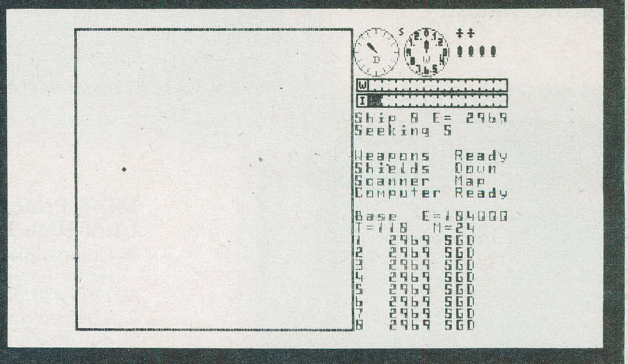

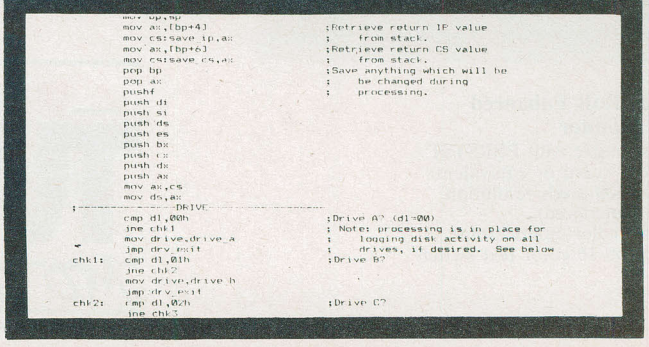

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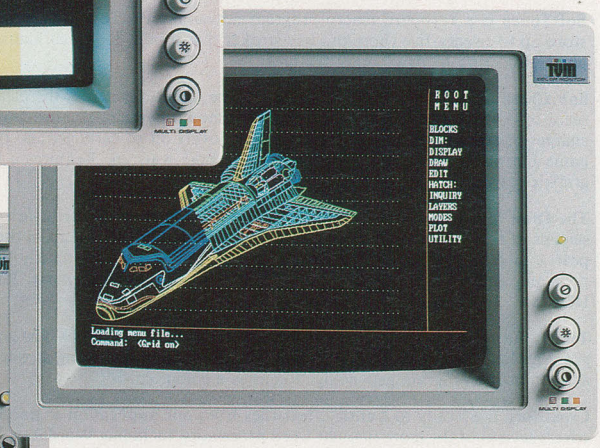

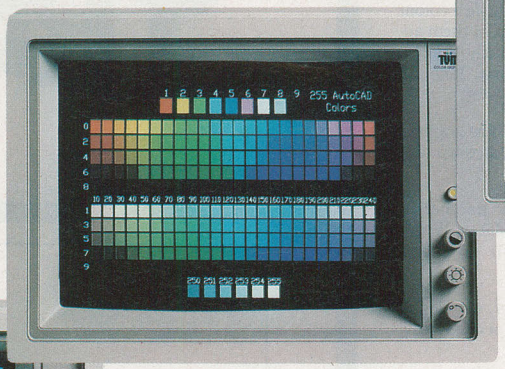

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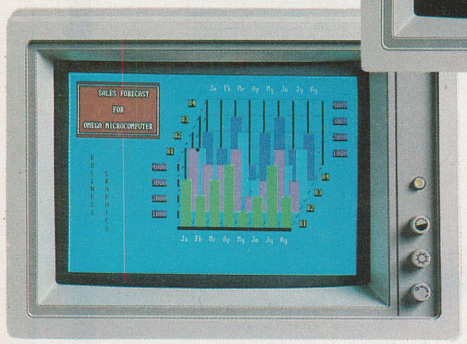

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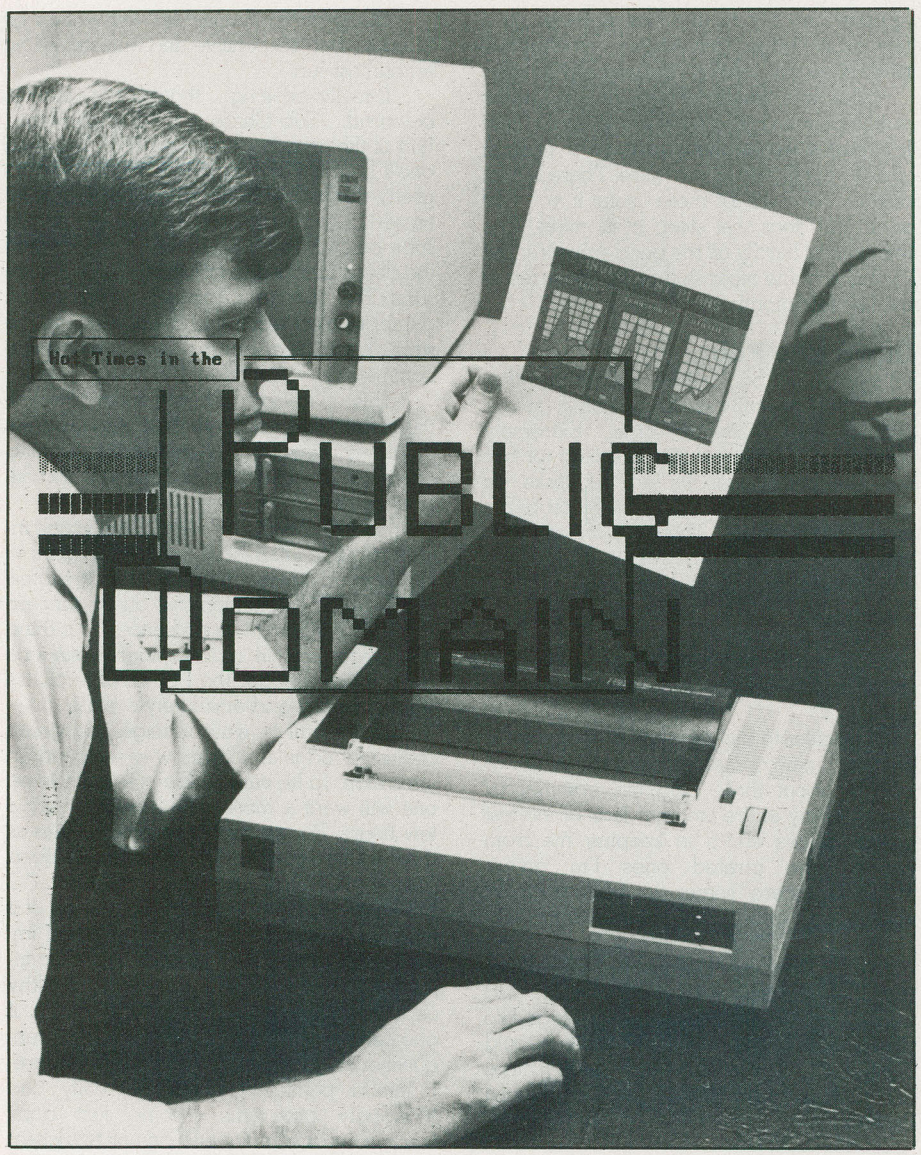


The most recent offerings of public domain software to sprout from the modems of land have been profound. Here's a look at some of the best code.

by Steve Rimmer

It's wholly cosmic what one can get for free. It can also be a bit frightening. This potentially erudite thought applies to a lot of things, but none more so than to public domain software. This article obviously being about public domain software, we'll leave some of the other applicable things... three legged racing zebras, almost working Honda Civics, mostly anything from Taiwan with chips in it... for another time.

Much of the best software in creation exists in the public domain. If you have the time... quite a lot of it... you can wade through the bulletin boards and download the good stuff. However, there are a lot of traps and nasties out there... mostly perpetrated by a few very strange heads.

The most recent innovation in the public domain has been the advent of the "worm killers". You might not have encountered these things as yet. By their nature, worm killers are fairly diverse. They behave unpredictably. The usual form of a worm killer is to have it print something interesting on the screen... naked women have cropped up in a few of these beasts... and, while one is watching whatever is going on, to erase one's disk or do something else technically unpleasant.

A few of them have, alternately, modified the operating systems of their victims so that they'll do something untoward some time in the future. It's especially true of hard drives that, what with hidden files, hidden subdirectories and generally a pile of space to wander around in, a worm killer can get buried with little fear of its being dug up before it pops out of its own accord.

It's a bit like "Aliens" without the space ships.

It's probably worth noting that not all the droids are at the other ends of modems. One of the companies that devises software copy protection schemes has suggested they'd get into the same sort of thing... their protection plan would bury a worm killer in one's operating system if one tried to use a cracked copy of the protected software.

Beyond these exotic little trolls, there is a lot of flotsam in the public domain partially camouflaging the good stuff. Depending on just what you consider to be working, you may well find that there is a good ten to one ratio of mindrot to stout, noble code. A lot of the aforementioned mindrot is just software that has been released with bugs, but, as the tradition of allowing one's source code into the public domain seems to have died with the advent of shareware and the PC, fixing these sorts of bugs is usually all but impossible.

Quite a number of things get released with deliberate bugs in them so that their authors can subsequently attempt to sell the rest of humanity working versions for a nominal consideration. Unfortunately, these crippled copies aren't always so labeled... it's a galactic drag to get well into using an

Public Domain

application only to find that it harbours a few subtle bugs... or, worse, a deliberate beg notice that won't let one get any further.

The traditionally funky nature of the public domain being what it is, over the next few pages we're going to have a peer at what's actually good out there. There is a lot of stuff... and it's lot more useful if you can avoid the dogs that sleep in its midst. The following is hardly *all* the good software, but it's much of the nicer stuff that's appeared in the last few months.

Down The Pub

I should point out, before we get into this, that all of this software is available on our Almost Free Software disks. Extremely cynical souls will view this as a plug for our in-house oxide, but we do the disks for much the same reason that you're probably reading this article. There's a lot of really weird code loose on the planet, and having to dig through it to find the good bits is a serious effort.

All of the software in this article is also available on bulletin boards... you can hook up a modem and go search for it if you'd rather.

I confess to having a great fondness for public domain computer games. I think I've bought about three paid up, commercial games in my entire life, and lack of interest comes before ethics in keeping me from playing the pirated ones I'm given. However, there seems to be something about the ones that come from real humans... instead of corporations... that makes them more interesting. Sometimes this makes them a bit funkier still... old public domain hands will recall things like Castle, which, upon saving a game, would replace all the monsters with roving nines and thirteens. It's a drag, being slaughtered by an integer.

Some of the recent efforts seem to be a lot more sophisticated and, so far as I've been able to tell, pretty well bugless. Among the best ones to date is Striker, a public domain helicopter game in the tradition of Choplifter. The object of Striker is to fly a small high resolution helicopter over enemy territory, shoot down lots of nasties, blow up hapless buildings on the ground below, avoid being fragged by an increasingly complex variety of flying death and, finally, to land and pick up one's spies. Actually, the plot thickens as one gets better at it and further into the game.

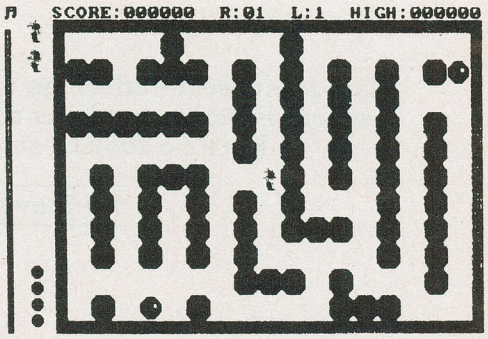
Striker is an amazingly well written bit of code, fast, responsive and an astounding amount of fun.

Equally exciting... though not quite as colourful... Sub Chase is a PC implementation of the arcade classic Sea Fox. One sails one's boat across the briny deep... it looks pretty deep, the boat being at the top of the screen... and drops depth charges on the subs below. It's a matter of timing, getting the depth charges to go off so as to snuff the subs. This is a great implementation of the game, in high resolution graphics, with the subs, boats and bombs all moving quite convincingly.

This one also has a panic key to blank the screen and return to DOS should one's employer show up unexpectedly imagining one to be doing actual productive work. Silly employer.

Round42 is the most colourful space invaders game imaginable... in fact, it goes so far beyond space invaders that it almost seems unfair to mention that dusty old relic of lesser systems in its presence. This thing really screams, in more colours than one might have thought the PC capable of. It's wholly deadly and absolutely a blast.

While wall to wall carnage and green oozing blood is a pleasant way to spend an afternoon, to be sure, there are times when one will want a more sedate way to slay a few hours. For moments like these... rare as they are for some of us... there are civilized games like Monopoly. That's PC Monopoly... the real, boxed up version of it is deadly tedious. The computer based implementation seems to put a bit more life into the whole ordeal of being a filthy capitalist bourgeoisie scum of the earth... if one can't be a real capitalist scum this is unquestionably the next best thing. There are, I should point out, a lot of really bad Monopoly programs... some just don't work, some are funky and one or two cheat a lot. Unfortunately, they're all called Monopoly on the boards so there's no way of differentiating among them until you've got them down and booted.



Pango is another one of those less than lethal bits of code that none the less manages to be amusing. It's a tad less easily described than is Monopoly... in fact, the actual meaning of it entirely escapes most people who try it. You get to control this lit-

tle guy who runs around a PacMan-like maze kicking the stuffing out of rocks and mashing bees. It's enormously fun and satisfying, if a bit cryptic in nature, and the PC implementation is superb.

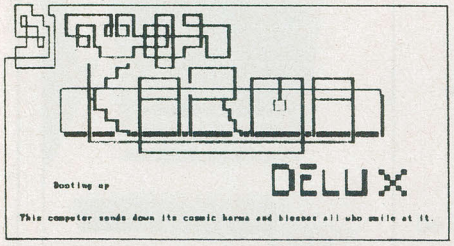
For even less action... but arguably more cerebral content... PC-Chess is just what one would expect. It plays a pretty evil game of chess, with a running clock, graphics and definable user levels. It seems to be based on the Sargon code that first cropped up back in the days of eight bit computers... if you can lay waste to Sargon you're probably ready to start your own war.

None of the recent games I've encountered has been anywhere near as much fun as Pinball, however, a graphic pinball simulator for the PC that's without equal. It behaves so much like a real pinball machine that you'll find yourself hammering on the sides of your monitor. The ballistics of the ball are unbelievable, the sound effects superb and the whole feel of the game unspeakably realistic.

I've wasted whole afternoons with it.

Practical Uses

There is a reasonable body of practical stuff in the public domain too... I know, after all those games the very idea sounds a bit blasphemous, but there are those souls who actually insist on doing useful, meaningful things with their computers. Sounds a bit alien to me, but, then, I always thought that spreadsheets were there to have picnics on.



My favourite quasi-productive program of late has been TheDraw, which is an ANSI screen editor. You probably don't even know that you have an ANSI screen, let alone a need to edit it. Well, if you place ANSI.SYS in the CONFIG.SYS file of you PC... assuming you have DOS two or better... the screen handlers will respond to a special set of escape characters which will do things like change the colour of the text to be printed, position the cursor and so on. Type a file full of suitable ANSI graphics and you can see a full colour block graphic screen show up on your PC.

Of course, creating the file is a bit tricky... unless you have TheDraw, which is a slick little screen editor designed for this very purpose. It gives one access to all the PC's colours in whatever combinations one wants to use 'em. It also allows one to access just about all the PC's special characters, including the freaky ones that make up boxes and shapes.... the latter are handled in banks through the function keys.

TheDraw screens look extremely slick in batch files and so on. They can also be incorporated into programs with a bit of effort.

Crossword isn't nearly as visual as TheDraw, but it's potentially very useful. It will take documents from any of a number of word processors and turn them into documents for any of the others. The list includes, WordStar, WordStar 2000, MultiMate, XYwrite and SideKick. It will also deal with and create straight up ASCII files.

I also like Cut and Paste, which brings a bit of the Macintosh to the character dominated universe of the PC. This is yet another memory resident program that allows one to copy any part of one's screen into a secret memory buffer and then later on paste it into another application. For example, one could copy part of a Lotus spreadsheet or a dBASE form into a WordStar file. It's especially good for people who have to write manuals and other sorts of documentation.

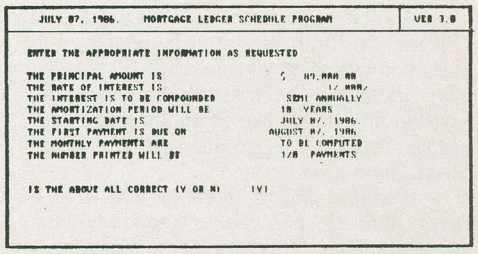
There are a lot of really decent spelling checker programs on the planet, but PC-Spell has the advantage of being free. It isn't quite as sophisticated as Webster's, for example... all right, it isn't anything like as sophisticated as Webster's... but it's eminently workable. It has a big dictionary and it's extraordinarily fast, considering that it's written in BASIC. The human engineering's quite nicely thought out, too.

The TYPE command of the PC is one of those traditional things that harkens back to much more primitive... and extremely loathsome... lesser operating systems. It doesn't page, it frequently doesn't pause when you ask it to and it has a penchant for scrolling what you want to see by you faster than you wanted to see it. The LookIt program is a really nice alternative to this. It shows you the text file of your choice a page at a time. It filters out the high order bits of WordStar files while it's at it. It also allows you to scroll backwards and forwards through files a page at a time, and it changes its pages instantaneously.

Despite their really powerful printing features, most Epson compatible printers rarely get out of their default modes because all the codes are so hard to remember. The FX Master program gets around all this by giving one a big menu of all the possible combinations of features available on an Epson printer and then setting the beast up as one requires it. Everything is done with painless English commands... there isn't an escape code in the lot.

Pretty well everyone has seen the sorts of huge signs you can get out of a printer with the right software... messages spelled out in eight inch high letters running sideways along the page. The right software is a program called Banner, which takes a text string as its input and renders it in gargantuan type on just about any sort of printer. Something that can manage a tractor feed is, of course, preferable.

One of the really unusual things I've come across for the PC is a program called Speech, which will actually make a PC talk without any sort of extra voice synthesizer cards at all. Its ultimate voice quality is determined by the quality of the speaker in your system... the really awful speakers that come with some clones don't render the greatest speech. However, it can ramble intelligibly through just about anything. The program itself is a resident thing, so you can have it verbalize from within other applications.



There are quite a few mortgage programs around. Like Monopoly... with which they are strangely similar, at least in concept... the mortgage programs I've encountered are all called the same thing and are of varying quality. Some of them are very subtle... they appear to run, but they make mistakes. The one I eventually scored and used... and put on an Almost Free Software disk... seems to be the best and most accurate of the lot. It told me, among other things, that I'd have my house fully paid for long before the sun goes nova... well, "long" is such a vague word.

DOS shell and menu programs must fascinate programmers... there are so many of them. SHELL is probably the best of them... it gives you complete control over all the features of DOS without having to type very much. It spews up menus all over your screen, but they're pretty to look at and arguably more functional than the command driven cryptic nastiness of the usual manifestation of MS-DOS. Menus are an acquired taste.

There is also a fair amount of really heavy business software floating around the boards. I've come upon a general ledger program and an accounts receivable package, both of which seem to work very well. I don't really claim to understand accounting... I've always been happy if I could keep more than a hundred bucks in the chequing account... but these things ran as I think they should have and produced answers that seemed to be right. More complex minds than mine may have to judge their absolute validity.

Hot Tracks

At the heart of the public domain there are, of course, programmers. Not surprisingly, quite a lot of the code one finds beeping through the modems of the planet has to do with the art of writing still more code. Some

of the hacker things one happens upon is actually pretty slick.

The INT13 program is rather unique, in that it comes complete with source code. It loads into memory and zaps the printer with the calling addresses and some other information about every call to the BIOS for absolute disk reads, INT 13's. This is useful because absolute disk reads are usually the basis for copy protection techniques. This thing allows one to see where they're coming from and, as such, how to undo the protection trolls and make backup copies of one's software. This is a very handy little bit of work.

Another program to check out is PMAP, which cruises through memory and tells you where all your resident code is living, including the parts of the operating system and things like SideKick and other, similar utilities. It helps make sense of what's happening inside your PC.

Breakout Box is more or less what it says, although one has to know what the phrase means to recognize its function, I suppose. This is a resident program that watches the PC's serial port and displays what's happening at it at the top of the tube. It's a classic for debugging telecommunications software, and comes replete with its assembler source so you can adapt it to your needs.

One of the most remarkable efforts ever to appear in the public domain, Z80MU is a very powerful... and, admittedly, sort of gigantic... CP/M emulator. Running entirely in software... it doesn't require a V20... it will allow one to execute most CP/M software on a PC without hacking anything. This includes assemblers and compilers, business stuff like old dBASE and SuperCalc, trusty eight bit WordStar and so on. It chokes on telecommunications things, and will probably have a hard time with hardware specific software for obvious reasons.

Among the uses of Z80MU are things like developing Z80 based object code on a PC, as I did for the Sloth small computer project looked at elsewhere in this magazine.

Disk zappers are as old as hacking. Among the good ones that you don't have to pay for are Xeno and, to a lesser extent, DU, which is sort of like the old CP/M DU disk utility. These little trolls will allow you to edit the tracks and sectors of your disks, unerase files, recover lost data and so on. However, be warned, the disk structure of the PC is a bit more involved than that of CP/M, and it's incredibly easy to trash an entire disk by using these things incorrectly.

I'm very fond of VTREE, which draws a map of the tree structure of one's directories. It's especially useful on hard drives. I should also mention D20, a small CP/M like sorted directory program. It stands out from all the other directory programs for me because of its carefully thought out human engineering, incredible speed and also because I wrote it.

If you don't toot your own horn from time to time it gets rusty.

One of the things that everyone here got turned onto for a while was something called X-ray, a memory resident program that lets you peer into a program while it's executing. It's a sort of a debugger that works in reverse.

I was very interested to find Zapload, which will generate object code from Intel standard hex files on a PC... the equivalent of the CP/M LOAD function with about six zillion additional features. Sadly, getting an 8086 assembler that wants to create the hex files is a bit tricky. It is useful if you're working with, say, the output of a CP/M assembler running with a V20.

Reboot

As I said, this isn't all the good stuff, but it's certainly the most interesting software in the vast sea of code that litters the public domain. Of course, by the time you read this there'll be a lot more stuff to check out... the volume of new applications that crops up on the boards in a month or two is prodigious.

If you do decide to download stuff, I'd recommend taking some reasonable precautions against booby trapped code. For one thing, don't ever run anything on system with a hard drive attached to it until you've checked it out. Likewise, keep the disk you use to meddle with public domain software someplace where it won't be used to run anything else... just in case there's something lurking on it.

Finally, something should probably be said about shareware and beg notices. These things seem to be turning up on virtually everything from three hundred kilobyte applications to thirty byte patches.

Our Own Beg Notice

We have several rooms full of our latest public domain software catalogues. If you send us a letter requesting one we'll cheerfully send it to you, thus gradually making way for the pool table the publisher has promised to buy us when all the catalogues are gone. Pool is this game that's played with balls and sticks and no computer... yes, one can actually amuse one's self without floppy disks, you know. Breaks the brain just thinking about it.

The latest software catalogue is completely free, and contains lots of software that's almost free... about twenty bucks a disk for most of it. It includes all of the software in this article.

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While I think that it's very decent to send money to some of these guys... the people who wrote things like Qmodem and PC-Write arguably deserve to be contributed to... some of them have been pretty outrageous. Dudes that want seventy bucks... those are American bucks, by the way... for a game, or several hundred dollars for a business package seem to me to be evading the point a bit. There seems to be a real polyester faction developing in the shareware heads... it's sort of sad.

You really don't have to send them anything if you don't feel they're worth it. It's a good trip to phone the programmer whose bank balance you're considering enhancing to find out just what your contribution will buy you. Very often phrases like "periodic updates" means that some of the menu colours will be changed from time to time. People who offer to send you free updates to a ten dollar program are playing with your mind... consider that it costs about half this much to mail out a single disk.

Finally, bear in mind that contributions to the authors of very weird or obscure software may make both you and its creator feel good, but are unlikely to bring you a lot of future support. Packages with six registered users just don't get upgraded.

CN!

The Micron Idetix Computer Camera Review

While PCs are pretty good at presenting visual information, they aren't usually up for accepting it. This box gives the PC an eye on the outside world.

by Steve Rimmer

One of the slickest peripherals I ever acquired for an Apple... back when Apples were still fashionable... was something called a "Micron Eye", unquestionably the celestial begonia of grown up playthings. It was a tiny solid state television camera that digitized whatever it looked at and zapped the resultant pictures up on the high resolution screen of the Apple. It was inexpensive, almost wholly useless and could keep anyone with the slightest wisp of imagination captivated for ages just dreaming up things to try with it.

It remains one of the few applications I still regard Apples as being good for.

The actual Micron Eye camera wasn't really dedicated to the Apple per se... only its interface card was, and that was pretty simple. As such, I've always meant to get around to devising a PC interface for the little guy. However, being almost wholly useless, it wasn't really all that high on my list and I've yet to actually do anything about it.

Recently, the creators of the Eye came up with a new solid state camera system specifically for IBM PCs, ATs and compatible systems. In all fairness, it's a lot better than anything one might have done in a single lifetime with the old Apple version. While, like its predecessor, it has no real function as it comes out of the box, its potentials are as limitless as light and reflection and memory expansion.

We're going to check out the Micron Idetix camera system here.

Faster Than Light

The basis of the Micron camera is a rather brilliant use for something that most engineers would regard as a problem. Silicon, the stuff of integrated circuits... and the basis for computers, among other things... is light sensitive. If you take a chunk of silicon and send some current through it, the amount of current will change with the intensity of the light falling on it.

This would be a drag for things like typical chips, as they'd behave differently when one took the cover off one's computer. To this end, their silicon bits are sealed up in impenetrable black epoxy, never again to see the light of day.

Memory chips, which are, of course, made of silicon, are constructed such the the bits of silicon that make up the memory elements are arrayed in a grid pattern. If one were to grind the epoxy from a memory chip to expose the silicon bit... extraordinarily carefully... and focus an image on its surface, the elements would contain a bit mapped rendition of what they saw.

There are a few drawbacks to this. For one thing, the memory bits can only be on or off, so the picture would have no grey scale. If the picture changed half way through the process of reading the data from the memory chip it would show up blurred on the final display... presumably a picture tube. Finally, unless one had rather a lot of memory, the picture would be a bit coarse.

All these things aside, one can create a pretty reasonable camera based on this principal, which is what the Micron camera

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is all about. It uses a specially built memory chip, an "optic RAM", which never actually had opaque epoxy on it in the first place. It also uses a dedicated microcomputer and a high speed parallel interface to move information from the optic RAM behind the lens to the PC's memory for display.

The Idetix camera is extremely tiny... a bit bigger than a pack of cigarettes. It uses a standard C mount movie camera lens, and will bolt onto a normal tripod. It's actually intended to hang sideways, with its long dimension horizontal. It has a kind of gargantuan connector out back for its computer interface.

By comparison with the camera itself, the interface board for the PC is anything but modest. It has a dedicated 62701 microprocessor to run the whole show and some very slick DMA circuitry to allow it to pass the voluminous camera data to the PC very quickly.

There are two species of optic RAM chips. The basic version has about sixty-five thousand elements, with a larger cousin having over two hundred and sixty thousand. There are a few catches to this. The elements are split into groups with small "dead zones" between them, two groups for the small array and three for the larger one. This is quite noticeable on the camera's pictures... depending on how one decided to handle the dead zones, there is usually a line though the image. One can, of course, use only one of the arrays if this is sufficiently dense for one's applications.

In fact, the dead zones don't really interfere with most of the things one can do with the camera. They are worth bearing in mind, however.

The image sensor of the camera can be set up with any "threshold" one wants. This may take some explaining. If you increase the light on the sensor gradually, you will come to a point wherein the data in the memory elements changes from zeros to ones. This point is the threshold. You can programmatically change this point. This gives the camera some of its more interesting capabilities. For example, while it can't see grey scales directly, it can work them out by scanning an image multiple times with the threshold a bit higher each time. One can have as many shades of grey as one needs, within reason, so long as one can keep one's subject still while they're being built up. Although I didn't see it, Micron maintains that they have a sixty-four level grey scale program available.

The camera can also be set up to work with a strobe... it will grab a frame just as the strobe goes off. There's a BNC connector on its rear panel to allow it to by synchronized with an external light source.

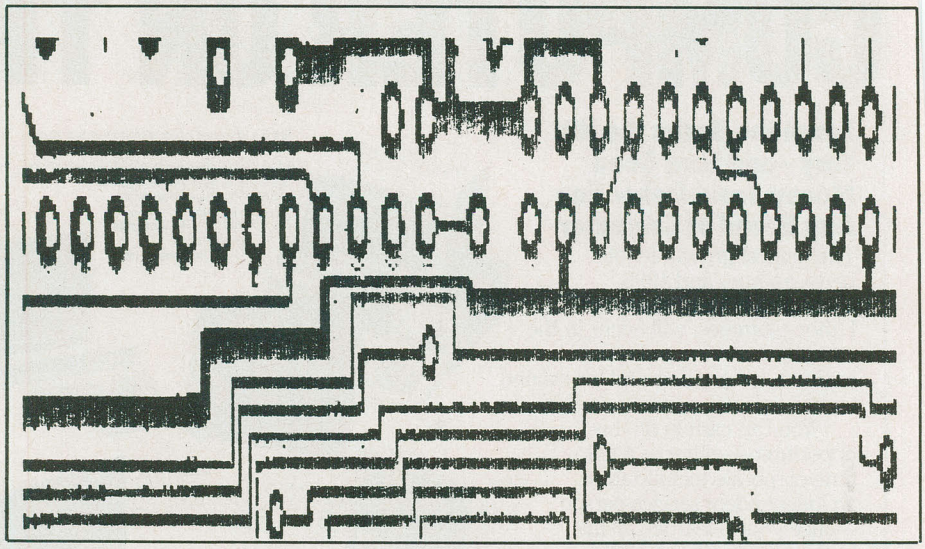
Interface To Reality

The camera package comes with two demo programs which do sort of serve to illustrate what the camera can do. The ones I got were probably beta versions... they had a number of things that didn't work properly in them. However, one would not buy the camera to run the demos.

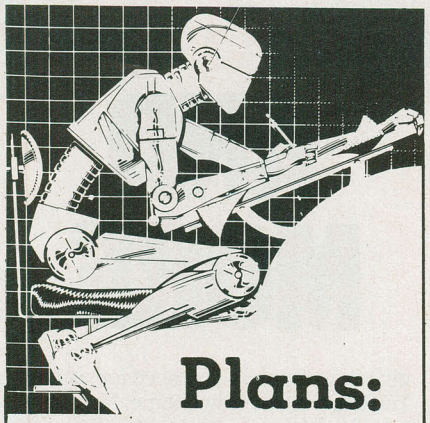
The disk that comes with the camera has a lot of very lucid source code on it to allow one to write dedicated programs to interface with the system. While the camera and its controller are very weird and complicated, actually talking to them isn't too involved. The routines work well... I wrote some little experimental programs with them and managed to get images from the camera on the screen looking a bit different from those of the demos. One can have a lot of fun at this level with image processing and computer enhancement.

The potential for getting the camera to do something will, of course, be a factor of what you have in mind for it. The straight up format of the data makes it pretty easy to manipulate and analyse. It is, however, large. You needs lots of memory to work with it.

The Idetix package is not one of thos things that no computer user should b without. In fact, most people will probabl make it through life without ever seeing on of these things and be none the worse for it There is no useful way that I can see to make this thing work with Lotus or any of the popular accounting software.



Part of a printed circuit board as viewed by Idetix



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System:	**IBM PCs and compatibles**
Manufacturer:	**Micron Technology, 2805 East Columbia Road, Boise, Idaho 83706, (208) 386-3800**
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There are a lot of very imaginative things one can apply the camera to beyond this. It's really good at scanning text, for example, if one equips it with the right external hardware and a closeup lens, and it could be the basis of a page reader. It's not bad at looking at photographs, either, especially with a bit of grey scale processing. It would make a really slick surveillance system, as the computer could check the data it sent back over multiple looks to see if something in the picture had changed. To this end, the Micron camera controller card can be made to handle multiple cameras fairly painlessly.

By comparison with some of the authentic frame grabber and digitizer things that exist for the PC, the Micron camera looks a bit crude. However, it costs about a twentieth of what any other useful traditional digitizing system would go for, and what it lacks behind the lens can be compensated for with clever software to an amazing degree.

The Idetix camera is a really interesting box, one well worth considering if you want your computer to be able to check out the world around it. It seems to be happy running on just about anything PC compatible... its controller has the extra connectors to allow it to directly access the extra memory of an AT. I tried it on a Best AVT 286, where it really hummed along nicely.

It's definitely more interesting than another printer. **CN!**

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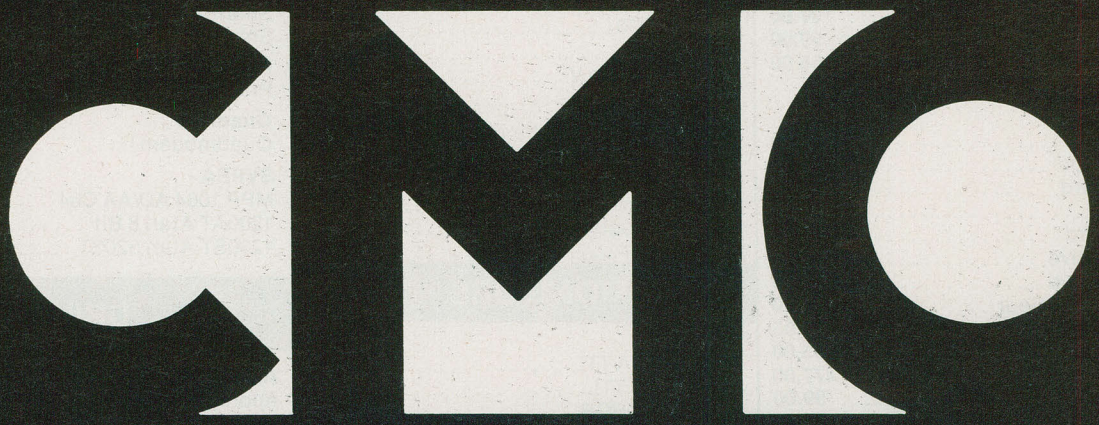

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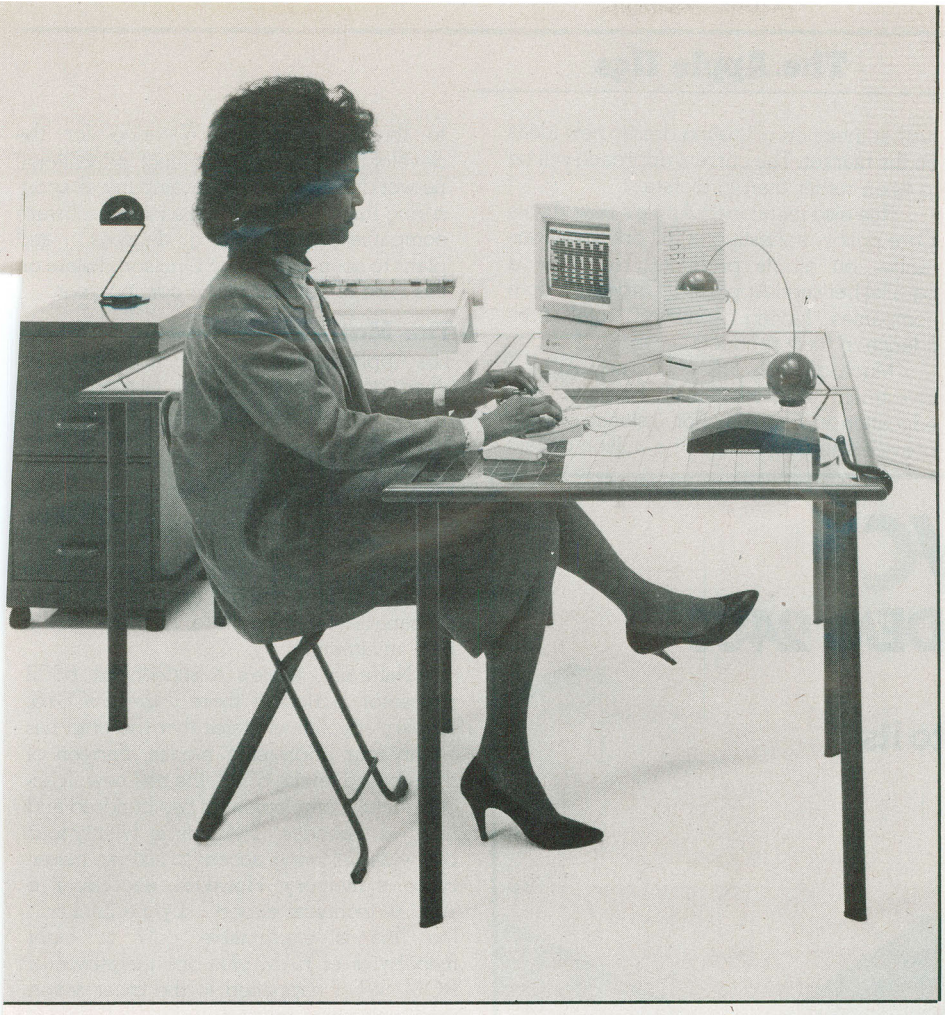


The Apple IIgs

Just when you thought it was safe to reformat all those single sided disks... there's a new Apple II. This one features a new processor, a new case design, new software and very few chips.

by Frank Lenk

When a marketing man speaks of excitement, he does not always mean the same thing that you or I might. However, at Apple's big August press briefing the word turned out to be somewhat appropriate... in a particularly odd sort of way.

"The star of today's show," said Apple's marketing man, Pete Jones, "is the Apple IIgs. This is an exciting new product." Right.

Well, the Apple IIgs turned out to be the long awaited sixteen bit Apple II. This machine has been so long coming that the excitement has already come and gone... several times... since Wozniak first spoke of his Apple IIx. Of course, the Apple IIgs is news just by virtue of existing at all.

Woz Doesn't Work Here Anymore

First, however, there was the corporate report... in this case, brought to us by David Rae, the president of Apple Canada. This was followed by a lengthy palaver to assure us that Apple "cares about what happens in the marketplace", and that it is now trying to become a "good corporate citizen" and "a more accessible company". One example of this new accessibility was the "sneak preview" which we of the press were currently privileged to attend.

This was a rather interesting example... considering some of the unpleasantness that had already been associated with the IIgs' announcements. All media personnel had to sign nondisclosure agreements... in force until mid-September... before Apple would admit them to the August briefing sessions. Nevertheless, all the technical details of the IIgs were leaked as early as July by one or more third party developers who had been working with the hardware. Front page coverage in an American computing news weekly reportedly resulted in Apple sicking detectives... no less... on its own developer base. Certain offending parties... it is reliably rumoured... were identified and are in fact no longer to be found on the roster of approved Apple developers.

To be sure, Apple's goal of simultaneous, controlled disclosure wasn't such a bad idea. The offending developers were also undoubtedly in violation of the very agreements that had given them access to the IIgs. Nevertheless, Apple's reaction makes it unlikely that the company will ever be mistaken for some sort of corporate friendly giant. As it did previously during the clone wars, Apple has once more proved that it plays very hard ball indeed.

David Rae gave no hint of these behind the scenes developments as he spoke glow-

ingly about the "really exciting things"... there's that word again... that Apple has in store for the coming year. He spoke of ensuring "customer satisfaction", citing a trade in policy that would allow remaining Lisa owners to switch to Mac Plus and Hard Disk 20 combinations. The cost of this transition... as with all pricing details throughout the briefing... was left to the imagination.

The Lisa itself was mentioned several times as an example of how "hindsight is a great teacher." It seems that Apple has no further intention of foisting drastic new ideas on the market. The current approach will be to listen rather than to dictate.

Rae also mentioned Apple's new *Apple Care* policy, consisting of full one year warranties on all its products. He drew a parallel between Apple and Chrysler... both companies having achieved total confidence in their products.

Much of Rae's talk concerned Apple's investment in both small business and education in Canada. For instance, Apple provided three-quarters of a million dollars to the University of Waterloo for the development of the MacJanet educational networking system. The company is sponsoring three or four hundred small software companies... in varying degrees... and plans to spend four or five million dollars on this type of venture in the coming year.

The Main Event

The Apple IIgs is a strange entity, especially when one places it in an historical and market context. The IIgs... or something like it... has been anticipated for as long as five years. Two years ago it would have been a breakthrough. Today... well, it still isn't a bad little computer. The big question will be who's going to buy one.

In terms of hardware, the IIgs is just the sort of hybrid one might expect... although its capabilities go quite a bit beyond the bare minimum.

Naturally, there's a sixteen bit 6502 processor buried in there... the 65C816. Apple's spec sheet states that the chip has twenty-four addressing modes, thirteen of them based on the 6502, the rest new. It accepts a full complement of two hundred and fifty-five opcodes. The bus is twenty-four bits wide, allowing access to sixteen megabytes of memory. However, according to Apple's technical expert... Lynne Zucker... the IIgs is expandable only to eight megabytes of RAM plus one megabyte of ROM. What happened to the other seven megs remains a mystery.

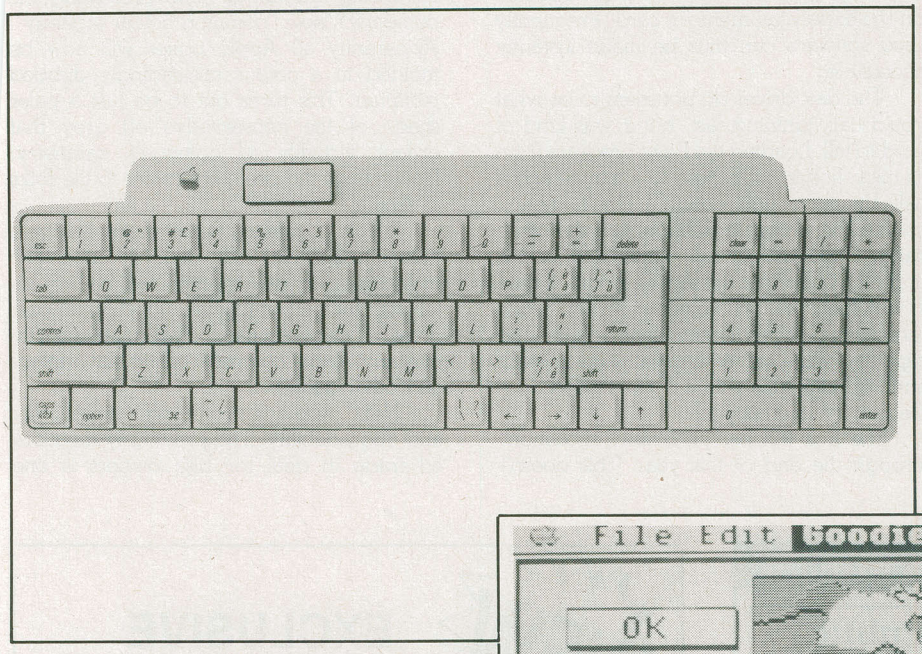
Custom accessory chips build the IIgs up into a fairly powerful system. The VGC *video graphics controller* and a stock Ensoniq synthesizer chip handle the *gs* part of the machine's name... graphics and sound. The Ensoniq provides thirty-two oscillators for fifteen stereo voices.

Several custom glue chips tie things together. The FPI *fast processor interface* handles system speed and I/O. The *Mega II* is a combination of several custom chips from the IIe and IIc, and includes character generator, video logic and expansion slot support. The *Sound Glu* chip interfaces to the Ensoniq synthesizer, and allows the Ensoniq to run asynchronous to the Mega II chip. The *SlotMaker* chip generates control signals and provides buffering of clock signals for the expansion bus. The SCC *serial communications chip* handles both serial I/O and the AppleTalk network. Finally, a *Keyboard Glu* chip interfaces to the new Apple DeskTop Bus. A real time clock is also tucked in there somewhere.

The system comes with a quarter of a megabyte of RAM and a hundred and twenty-eight K of ROM. Nevertheless, the motherboard looks oddly underpopulated... just an occasional square package here and there and zillions of hairlike circuit traces connecting them. Still, the good old Apple II slots along the back make one positively misty-eyed with recognition. There are eight

on the motherboard. Seven are compatible with earlier Apples. A new slot along the side of the board accepts a ROM/RAM expansion card.

The IIgs doesn't expose its slots quite as shamelessly as did earlier Apples. The back panel has openings corresponding to the expansion slots... but all are neatly coverplated. Along the base of the case is a whole new row of connectors. From left to right, these include a sound jack, two eight pin mini DIN serial ports... capable of tying into the AppleTalk network... a D type joystick port, a slightly wider D type disk drive port, the RGB monitor connector, an NTSC composite video output and the ADB DeskTop bus port. At the far right corner is a jutting fixture that provides the very lowest level of data security... it lets you chain the machine to your desktop.



One other important port is not actually standard, but will be provided as an add on card. That's the SCSI interface, which will enable the IIgs to take advantage of peripherals... especially fast hard disks... already available or on the way for the Macintosh.

Its colour display is where the IIgs will visibly break away from earlier models. There are seven modes... forty and eighty column text plus low, high and double high resolution graphics duplicate older IIe modes. Its super high resolution mode offers three hundred and twenty horizontal pixels by two hundred vertical, displaying sixteen colours at a time, chosen from a palette of four thousand and ninety-six. A still higher resolution mode gives six hundred and forty pixels across, but with only four colours on the screen at a time.

The suggested display device is Apple's new RGB colour monitor. However, you can also plug in a colour or monochrome composite tube, if you insist.

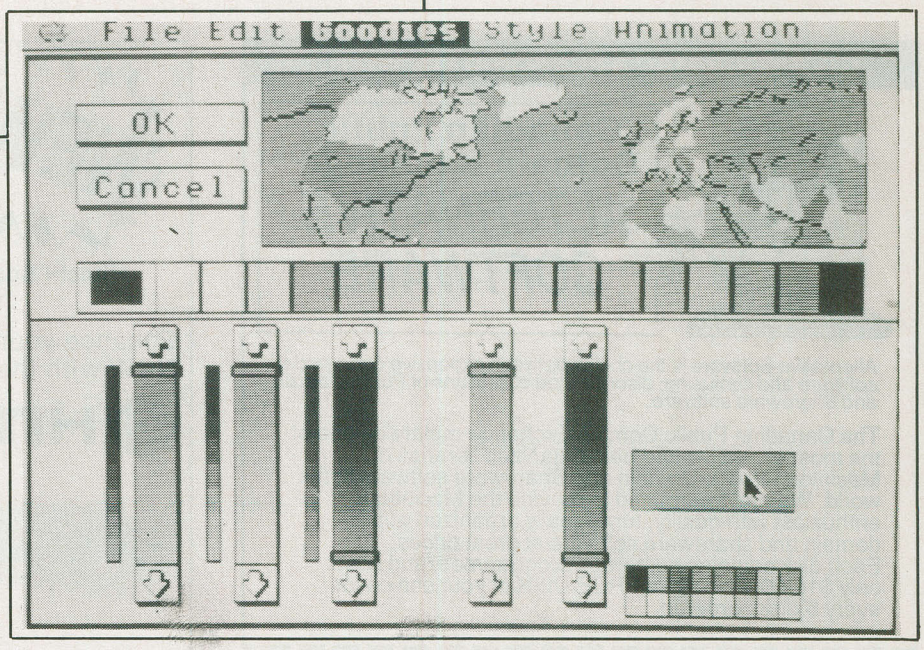
The IIgs keyboard is a whole new trip for Apple. It's distinctly peculiar appearance results from the absence of any kind of border around the key area. This makes the keyboard compact, but a bit of a shock to the eye. The keys themselves are the square kind that leave no gaps in between... usually the hallmark of truly gross laptop units. Surprisingly, I found the IIgs keys had a rather seductive feel to them... a relatively short travel, but with nice solid action and a positive click.

The keyboard layout is good, with big return and shift keys, and the control key is in its proper location. However, the cursor keys are still in their awkward IIe configuration... in a row, this time at the bottom of the keyboard. There is a numeric pad, something Apple has dragged its feet on for far too long. Numerous other keys are carried over from both the Apple IIe and the Macintosh.

The keyboard attaches to the DeskTop bus port at the back of the main box. The advantage of the new bus arrangement is that control devices can be daisy chained. The mouse, for instance, plugs into the back of the keyboard. It and the main connecting cord back to the computer can be connected to either end of the keyboard... great for left handed mousers.

The mouse itself is new. Its profile is lower, much more like the Microsoft mouse for the IBM. The little glide pads on the bottom of the mouse have been replaced with Teflon strips, which provide it with an unbelievably smooth sliding action. The mechanical guts look totally new as well, although only time will tell the degree of improvement there.

Overall, the IIgs box is attractive enough. As you might expect, its footprint is about the size of a IIe with the keyboard sheared off. Its most notable... and annoying... omission is the lack of any provision for internally mounted disk drives. If Atari's planned expansion bus ST materializes this fall, the IIgs will become undisputed industry leader in the field of desktop clutter.



See Jane Run

The big question, of course, is how does it run?

I didn't have a chance to see actual Apple IIe software on the machine, but Apple claims that well over ninety percent of the older stuff should run on the IIgs, and at about three times its accustomed speed. For games and other time critical programs the IIgs can run a pure 6502 emulation.

The sample of true sixteen bit software that I saw at the briefing was certainly able to hustle along. The graphic screen redraws

showed a tad more flicker than you'd see on a 68000 machine, but less than you'd get on the 8088. Of course, the IIgs has some dedicated graphics hardware helping the processor along, so this comparison is not likely to be typical of processing speed in less screen intensive situations.

The paint software Apple demonstrated is probably the best single selling point for the IIgs. It has literally all the features of MacPaint, plus colour. Above the pattern palette at the bottom of the screen is a second row of sixteen boxes, each containing one of the screen colours. Each colour can be adjusted using red, green and blue intensity slide controls in a pop up window. The demonstration images included a digitized pin up photo and several more graphics. These all put me in mind of the Amiga as far as detail and colour... not surprisingly, since the display specs of the IIgs are similar to those of the Amiga, omitting the latter's highest resolution mode as well as its dedicated animation hardware.

Apple also demonstrated a beta version of desktop software that makes the IIgs act almost exactly like the Mac. All the pull-down options are the same. However, the control panel has been vastly expanded to allow the selection of screen colours, setting of the real time clock, configuration of the system speed, configuration of the keyboard layout, assignment of the expansion slots and many other parameters. The IIgs can default to either its fast clock mode or to *system select*, which will automatically try to run your software at the appropriate speed. RAM disk emulation is apparently built right into the control panel. The machine can also be set up to boot from extra ROM installed on the expansion memory card. Frequently used software can thus be made instantly accessible.

The disk drives do not seem to be what you'd call lightning fast, but it was kind of hard to tell. Loading the Paint program from its microfloppy took close to a minute and a half by my rough count. I don't know... maybe the program is huge. On the other hand, it took about ten seconds to load a graphic, and about the same amount of time to get the ProDOS welcome screen when rebooting... which is not terribly bad. The capacity of the drives is great... up to eight hundred kilobytes with a double sided double density microfloppy.

The IIgs will be "on limited allocation" through the end of this year. This doesn't mean you won't be able to get one if you really want to, since thousands will in fact be shipped into Canada starting in October. However, a full scale supply is not being guaranteed until January.

To Market, To Market

Apple's product marketing manager, John Boyle, made some very significant points regarding Apple's plans. He also spent a disturbing amount of time presenting the company's new "common colour strategy". Apparently all Apple boxes will now be molded in a colour misleadingly dubbed *platinum*. This turns out to be just a paler shade of the conservative off grey that graces virtually all computer cabinetry. However, it did seem important to the folks at Apple.

Apple is making some more concrete moves to improve its market presence. The most important development will be fully interchangeable peripherals. Any Apple disk drive... floppy or hard... will plug directly into any Apple computer. Ditto for printers and other gadgets.

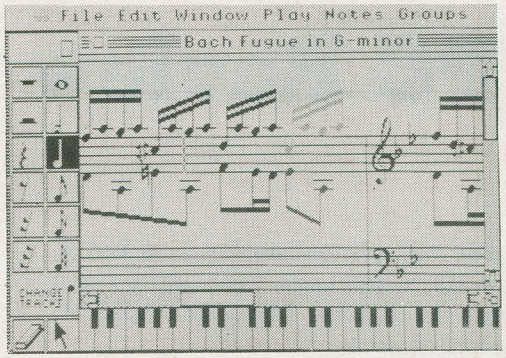
Next, Apple is promising compatibility and upgradability. The previously mentioned trade in deal for Lisa owners is one

aspect of this policy. Another is the possibility of upgrading your Apple IIe to a IIgs... a simple trick, as one just replaces the motherboard. The exact price for this trivial operation was... ahem... not available. However, it will probably run about "thirty-five to forty percent" of the cost of a new machine.

Finally, there's a commitment to "forward and backward compatibility". Thus the Mac Plus or the IIgs will be able to run... "not always one hundred percent"... but at least "ninety to ninety-five percent" of their respective predecessors' software.

I'm not sure about the definitions of "forward" and "backward" in this context. It's easy to ensure that your new machine will run the old software. It is impossible to ensure that new software will run on your old machine. In fact, you can be sure it won't... otherwise, there wouldn't be any point in introducing a new machine. This line of reasoning should give current Apple IIe owners pause. Its consequences have successively overtaken owners of the Apple II+, the Lisa and the original thin Macintosh.

Apple itself has some interesting views on the potential market for the IIgs. The primary market is expected to be in education, where customers have apparently been pining for an Apple II with better



graphics and sound. As a bonus, the IIgs will provide a friendly Macintosh type interface, networking, and peripheral compatibility. The IIgs is expected to get somewhat less play in small business, selling mainly to companies that already rely heavily on the Apple IIe. The home market is expected to stick with the IIc, because of its simplicity and lower price.

Although no specific prices were forthcoming from Apple, they did drop a few hints. The IIgs will be priced "midway" between the IIe and the Mac. The IIe is already rather expensive, so you can draw your own conclusions.

Queried regarding such competition, Apple was about as reserved as one might expect. The company has no intention to compete with "very low end" equipment such as the Commodore 64. It is also "not attempting to price match anybody dead on". Their theory is that the available software and peripheral base for the Apple II places it in an entirely different value category from newer machines such as the Atari ST. Peripherals themselves seem to follow the same logic, only more so. For instance, Apple's present HD 20 hard drive runs close to two thousand dollars in Canada, and its new SCSI version of the same drive will cost "ten to fifteen percent more".

Pricing is in fact the major bone of contention with the Apple IIgs. It's quite a nifty box, but not exactly cost competitive with the Atari ST... and maybe not even with the more expensive but much more advanced Macintosh or Commodore Amiga. The only clear advantage of the IIgs is its ability to run masses of old eight bit Apple II software... but then, in this thirty-two bit age, just how much is that worth? As Apple itself has implied, the market may be limited to schools and those few business users who are incurably addicted to AppleWorks. **CN!**

The MEX PC Review

Modem programs have been around almost as long as have modems themselves. MEX PC, with a heritage that dates back to the earliest days of telecommunications, is an example of the commercial sort.

by Brian Greiner

Back in the stone ages of microcomputers, before the IBM PC, before five inch disks, giants roamed the earth... giant eight inch disk drives, giant megawatt power supplies, and room filling microcomputers. These were the days of the one true operating system, CP/M, and the one true modem program, MODEM7. But, alas, there was no one true computer, so anyone wishing to communicate with their modem had to struggle to write a device handler that enabled MODEM7 to talk to the wee beastie.

In this, the best of all possible times, we have been blessed with the one true computer, and a multitude of modem programs that will run with no need for the user to learn the intricacies of assembly language programming. This is the story of MEX, a modem program that made the transition from the CP/M era to modern times.

Executive Toys

MEX stands for Modem Executive, and it fully lives up to its name. It allows the user to communicate with remote systems, transfer files, maintain multiple telephone number directories, perform multiple number dialing and automatic redialing of telephone numbers, run other programs from within MEX and to define function keys. For the transfer of files it offers a variety of protocols including XON/XOFF, ASCII dump/save, XMODEM CRC, XMODEM checksum, YMODEM, KERMIT, and the CompuServe A protocol. Many of the useful DOS commands are supported from within MEX, including DIR, REN, DEL, TYPE and such. There is even a "script" feature that allows the user to set up a sequence of totally automatic actions for MEX, similar to the DOS batch function.

In operation, MEX can operate in a menu driven or command driven fashion. That is, the user can operate from a series of menus, or from a single command line. In general, new users tend to prefer menu driven systems, which tend to be easier, if slower, to use. However, preferences shift towards the faster, more efficient command driven mode as experience is gained. Most programs for the PC tend to be either one or the other, so it's nice to see a package handling both.

The command driven mode will be quite familiar to anyone who has used MEX or MODEM7 on a CP/M system. There is a built in help feature that ranges from adequate to very good. The various parameters are twiddled with the STAT and SET commands. These parameters can be changed for a once only occasion, or the CLONE command can be used to create a semi-custom version of MEX with all the changes permanently saved.

The manual is well done, fairly extensive, and contains a hundred and seventy-three pages of information. It covers the initial startup procedure, how to use the various features, a summary of STAT variables, a summary of commands and an excellent index. I like manuals with good indexes, as it makes finding information ever so much easier. The manual does have flaws, however, as I'll mention later.

There are a couple of auxiliary programs for MEX available as well. The first is a package that allows MEX to emulate the operation of the DEC VT52 and VT100, as well as the Televideo 925 terminals. The emulation package also includes a program that allows MEX to support colour monitors and direct memory access for faster screen updates. The emulations are, in truth, not complete, but offer a fairly large subset of the original features. The enhanced video features should have been part of the original package, not an extra cost option.

The second package allows the user to set up MEX to operate the computer as a dial in system. That is, it allows the user to access and operate the computer from a remote terminal. The package allows access either via a dedicated serial line or a modem and telephone lines. It offers password protection so unauthorized users won't be able to get into the system. It does not, however, allow for multiple baud rates. That is, the system will not adjust itself to the baud rate of the incoming signal, but rather is simply set once and that's it.

Actual Carriers

As modem programs go, MEX does the job quite well. It has lots of features, good documentation and it is easy to use. However, I wouldn't rush out and buy it. The reason for this is quite simple: there are a number of public domain programs around that offer most, if not all, of the features of MEX. Two of the better public domain telecommunications programs that I use are PROCOMM and PIBTERM. True, the documentation is no where near the

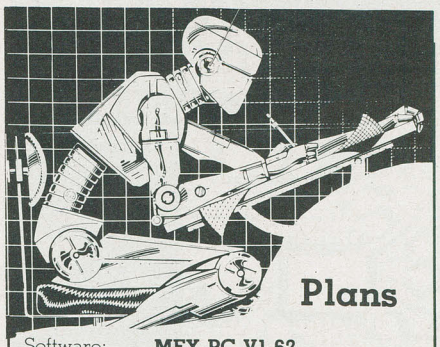
quality of MEX's, but then, neither is the price. And these public domain programs often offer, for free, remote operation and emulation capabilities.

On top of this, I find the public domain offerings easier to use. I've been using modem programs on both CP/M and PC systems for some years now, not to mention numerous other packages. It still took me about half an hour to get MEX configured for my system.

First of all, the manual is totally wrong about the way the package starts up. It claims that MEX boots up into the command mode. However, for me it booted up into the menu mode, with no apparent way of getting out of it. Neither the manual or the update sheets were of any help, since both took the command mode as the starting point of all operations. The help function at this point is totally useless, and the menu options often misleading.

By sheer luck I managed to get into the command mode. Then I had to change the communications port from one to two. The otherwise excellent index simply pointed me to a page that claimed that changing ports was easy, but gave no clue as to how to do it. I eventually found the information and got that point straightened out.

I tried to dial out, but the default was for a touch tone line, while mine is the old pulse type. There was absolutely nothing in the manual about how to change the dial out mode. Eventually, I found the information in the update flier that was included with the manual. The option was changed with the STAT command, but it was not displayed when all the STAT settings were printed out, nor did the help feature mention it. I have never, ever had this much trouble installing a modem program before. Even the worst of the public domain modem programs display the system parameters better than MEX does, not to mention making them far easier to change.



Plans

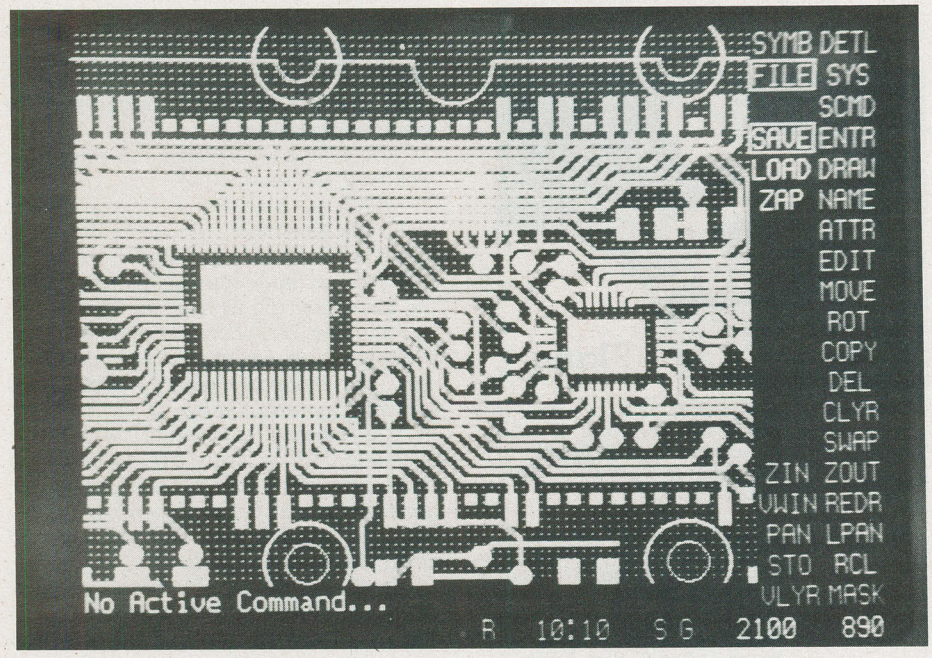
Software:	**MEX PC V1.62**
Price:	**$59.95 US; Terminal Emulation Option $29.95 US; Remote Operation Option $29.95 US**
Availability:	**Canada Remote Systems, 4198 Dundas Street West, Suite 311, Toronto, Ontario M8X 1Y6 (416) 231-2383**
Manufacturer:	**NightOwl Software, Inc., Route 1, Box 7, Fort Atkinson, Wisconsin 53538**

Once I got MEX configured, it ran very well, and was easy to use.

All in all, MEX PC is a complete and well implemented telecommunications package. The package suffers from a couple of major flaws, though. The first is that the initial configuration of the system can become needlessly complex and frustrating if one has to change anything from the standard, out of the box setup. The second is probably more in the eye of the beholder than an inherent problem. However well done MEX PC is, there are a number of public domain programs that do an equally good job for free. Some of them even come with the source code, allowing users to modify them or add features.

In spite of the problems that I had getting MEX up and running, I like it. It's just that I can't see any reason to use it in preference to one of the excellent public domain modem packages. **CN!**

A Look at P-CAD



A twenty thousand dollar printed circuit board design package may not seem like really cost effective software. However, P-CAD is the '63 Rolls Royce Silver Cloud of board CAD packages.

by Frank Lenk

You might suspect that a lot of high class electronics is produced with the aid of still more high class electronics. This is true. Even the average microcomputer can be a very serious tool for the electronics designer... especially when it's helped along by thirty or forty thousand dollars worth of sophisticated software.

Producing electronic circuitry... like most other creative tasks... is an iterative process. A word processor allows the writer to change words, shuffle paragraphs, add sections... all without using an eraser. A spreadsheet lets the accountant or manager lay out a mass of numbers, then play with their configuration simply by altering individual items.

The mechanical designer takes advantage of drafting software such as the renowned AutoCAD, or analytical programs for tough chores such as finite element modeling. An electronic designer has rather different needs. A simple drafting package could be used to draw a circuit... but after all, an electronic circuit is far more than just a particular geometrical configuration of wires. Sufficiently smart software can practically design a circuit from its basic parameters. Less advanced systems can at least prevent the designer from making simple structural slip ups... much the way an on line spelling checker can eliminate bad spelling or even awkward grammar.

Unlike work processing software, electronic design tools tend to run into moderately big bucks. In the absence of a captive system of our own we were fortunate to have some well equipped friends invite us to have a look over their shoulders and see how it all works.

Hard Choices

Some time back I spoke to a company called Telepanel, in Markham, Ontario. These folks are creating a miniaturized displays that can snap onto supermarket shelves. For our present purposes, the significant thing about this display panel is that it contains a fairly slick printed circuit board. The display is actually so compact that stock integrated circuit chips simply won't fit. The company has recently begun using surface mount technology... mounting its own custom silicon wafer directly on the circuit board without the usual protective DIP package.

The design of this circuit board has progressed through many stages, starting with breadboard arrangements and progressing through ever smaller and slicker renditions. There's nothing unusual about this process... which is another way of saying that Telepanel's design problems are quite typical of any company doing sophisticated electronic design. Their particular solution was to purchase complete P-CAD software, created by Personal CAD Systems, in California, and distributed hereabouts by Interfax Systems Inc.

Telepanel runs P-CAD on an IBM AT with a thirty megabyte hard drive. Its display is via a Conographics high resolution adapter. The latter provides resolution of six hundred and forty pixels horizontally and four hundred vertically... double that of the IBM colour graphics adapter. It also provides a palette of two hundred and fifty-six colours, displayable sixteen at a time. The red, green and blue signals it puts out are pure analog, giving it better resolution than the usual digital output. P-CAD will work with all sorts of display hardware, and includes a driver for the Conographics adapter.

The fancy video output needs a comparably fancy monitor... in this case a nineteen inch Electrohome. It's a big box, and looks like it would be more at home in the family rec room than on a desktop. The monitor comes with your choice of compatibility... in this case an adaptor that accepts Conographic input.

The total cost of the whole system is reasonably moderate... considering. The Conographics card runs about seventeen hundred dollars Canadian. The monitor is about another twenty eight hundred. Then there are some odds and ends... a Mouse Systems mouse, for instance.

The basic P-CAD software starts at about eight thousand dollars, and can run to about thirty or thirty-five thousand for a full blown setup. The main P-CAD module is strenuously copy protected, requiring a unique identification box to be plugged into the computer's serial port.

For output Telepanel has been using a Houston Instruments plotter, driven by a dedicated PC compatible. P-CAD spits out plotter files, which are transferred to the PC on disk. Plotting can take up to five or six hours for artwork quality. P-CAD supports a good variety of output devices... from your average dot matrix printer right up to half million dollar photoplotters.

Soft Selections

Circuit design proceeds in stages, from schematics through to final printed circuit artwork. P-CAD is a correspondingly modular system.

The two basic P-CAD modules are similar in size and layout, and cover schematic capture and circuit board layout respectively. A third module handles logic simulation. A number of other programs act as intermediates between these major

modules, providing features such automatic routing of traces.

According to both Telepanel and Tony Tirelli of Interfax, the strength of P-CAD is its integration. Competing systems such as FutureNet interface to modules from various publishers. P-CAD, on the other hand, is written entirely by Personal CAD... which has been supplying essentially the same system for several years now. Not only do the individual modules seem to stack up against the best in the business... they also fit together in a relatively seamless manner.

Telepanel bought the major modules and most of the intermediate stuff, but passed on the logic simulator. This one module apparently struck them as "relatively limited and fairly cumbersome"... in distinct contrast to the rest of the system, with which they have been mightily pleased.

P-CAD handles circuit boards up to about five feet square... although it's hard to imagine what anyone would do with a five foot circuit board. Up to fifty layers are available for graphic data. P-CAD also generates various data reports... wire wrap lists, bills of materials, packaging lists... in formats compatible with most common spreadsheets or database programs. P-CAD files can be exported to mainframe CAD systems. Also, most subsystem manufacturers are able to accept construction data directly from P-CAD.

On disk, P-CAD takes up at least six megabytes... and up to about fifteen megabytes if all the component libraries are loaded. P-CAD supplies libraries covering all the standard components, including TTL, CMOS and the rest. The TTL library alone contains about nine hundred items, and the whole set runs to about four thousand. Parts are stored as "smart components"... including their basic appearance, a schematic representation, logical behaviour and so on. Purely graphic details such as rotated views are calculated on the fly.

P-CAD uses cache memory techniques to speed its disk dependent operations, but supports only the normal six hundred and forty kilobytes of DOS memory. Presumably there's RAM left over, since Telepanel had ProKey residing in there as well. P-CAD does not support the use of a math coprocessor, as it's based entirely on integer arithmetic. This is understandable when one considers that electronic CAD has no need to calculate odd angles and such, working mostly with rectangular objects on an orthogonal grid.

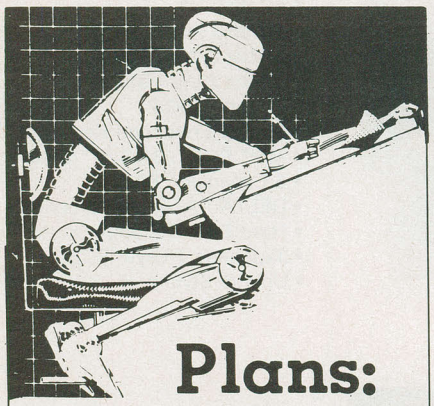
Jim Allison... the electronic designer at Telepanel and all round P-CAD whiz... began my tour with the PC-CAPS schematic design module. As with most graphic software, what you see is a blank screen, a crosshair cursor and a menu... in this case, a series of cryptic three or four letter commands listed down the right hand edge of the display. These commands can be selected by mousing them. Alternatively, hitting the slash key allows commands to be typed in directly from the keyboard. There's even a macro programming feature, accessed using the *macr* and *exec* commands.

Many of these commands turn out to be anticlimactic; *sys* gives access to file operations like *load, save,* a DOS shell and plotter output.

The *draw* command provides a submenu that includes line drawing, rectangles, filled rectangles, circles, arcs and text. An *edit* command controls some more obscure functions. One can, for instance, add a vertex to a wire line... thereby kinking the line. Otherwise, wire lines tend to follow the shortest course using only ninety degree bends to get where they're going. Vertices can also be deleted, straightening a line. Line end points can be picked up and moved. Entire line segments can be picked up and moved. A final option lets you move a line from one image layer to another.

As with most professional CAD systems, P-CAD allows the designer to arbitrarily split the graphic image up into layers. Each layer can be assigned a colour and a rank in the sequence used when plotting. Layers can be switched off entirely to clear them out of the screen view. They can also be protected from editing commands... *masked*... leaving the layer visible but shielding it from inadvertent alterations. P-CAD comes with a broad selection of default layer names, encouraging the designer to separate structures such as wiring, buses, gates, pins, pin numbers, solder dots, device names, and even text annotations. The user is free to rename these or add more layers for his own convenience.

Naturally you can zoom in and out... up to ten levels of magnification, each double the last. You can also pan from side to side, in several ways. You can simply specify a co-ordinate to centre on the screen. You can also get a simplified overview of the entire co-ordinate plane and simply mark an area to view. Finally, you can use the co-ordinate overview to predefine a number of windows. P-CAD will then let you flip between them, even changing zoom levels automatically to fill the screen with the preset window area.



Plans:

Software:	**P-CAD**
Manufacturer:	**Personal CAD Systems, California**
Availability:	**Interfax Systems, 3395 American Drive, Unit 12, Mississauga, Ontario L4V 1T5, (416) 671-3920**
Price:	**Basic software about $8,000; up to $35,000 fully configured**

Boarding Pass

All these drafting features are common to both the schematic capture and board layout programs. In fact, you have to look sharp at times to be sure which module you're in. However, mere drafting doesn't get you very far toward creating a working circuit.

The most important command in the whole PC-CAPS module is *entr*. This brings up a sub menu that includes the more revealing commands *wire* and *comp*. In this case, *comp* stands for component, and gives one access to the component library. You select a component by name... for instance, you might select a chip in the 74LS series by entering its designation. This is where P-CAD begins to really pull away from a mere drafting system.

The system coughs up a schematic rendering of your chosen component. You choose its orientation, magnification and location on the drawing, then plop it into place.

Once you have some components lying around you can start to connect them up using the *wire* command. This acts like a simple line drawing command. However, as far as P-CAD is concerned it draws not just lines on paper but actual electrical connections. P-CAD keeps track of what's connected to what, and is therefore able to do things like warn you if you're about to connect two separate networks to each other. That is, if you simply attach one line to another, the system will show a prompt and ask you if you're sure you want to connect these two nets. On the other hand, an existing net can be extended by adding new wires... P-CAD knows the difference.

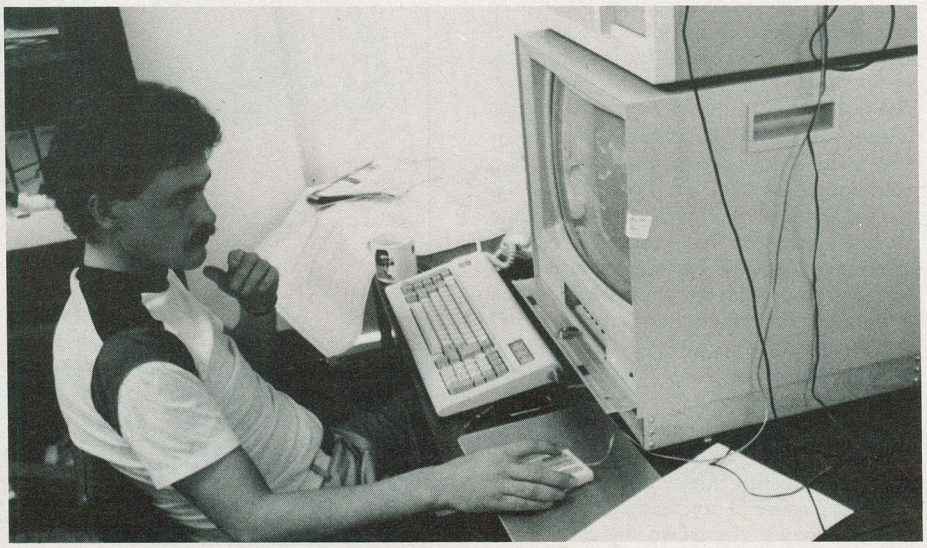
Having created a schematic in rough, one might next have PC-CAD generate pin numbering, using the *pnum* command. At this point you begin thinking about assigning pins locations to specific physical components. The *swap* command allows logical gates to be reassigned, and will issue a warning if you try to do something dumb like using an output pin where an input is called for.

After this one needs to process the design... the data base... through several intermediate programs. PC-NODES accepts the database file and creates a net list file. PC-PACK takes the net list, the component library and a layer structure definition file and creates several new files... including a circuit board data base, packaging report and annotated net list. When we ran into trouble with directory specifications in PC-PACK it disgorged a text file full of error messages, much like some of your less friendly compilers would do. I didn't experience the full range of messages, but the ones I did see tended to say things like "this part does not exist... this logic gate left unpackaged."

Eventually, armed with a... valid... pack file, you are ready to plunge on into PC-CARDS, the board layout module. As mentioned before, the layout inside this module is much like that of the schematic capture system. Now however, scaling becomes a reality. Wire lines acquire a preset thickness, measured in thousandths of an inch. Connections are drawn from point to point as before, but now the F1 key can be used to take the trace over to the opposite side of the circuit board. PC-CAD automatically inserts a plate through... a *via* in tech talk, or a connecting hole to you and me.

PC-CARDS provides component placement functions similar to those of PC-CAPS. There's also a *swap* function, that allows components or individual gates to be interchanged. PC-CARDS will move all their associated wiring automatically. The module also continues to provide a warning if two wire nets are being merged.

All this placing and wiring and swapping results in what is technically known as a *rat's nest*. Traces run all over the place, in no rational pattern. This is where the PC-HISTO module comes in. It gives the designer a plan view of his board with histograms... bar charts... running along the sides. These charts indicate the degree of clutter along their associated strip of the board. Also, a numeric merit score reflects overall congestion. As components are



shifted around, the designer gets a dynamic indication of just where the trouble spots lie. The ideal rat's nest... confused though it may be... should have a fairly even distribution of congestion.

Once this enviable status has been achieved, the board is ready for the autorouting module... PC-ROUTE. This uses various algorithms to position traces in a coherent manner. A percentage score gives a constant indication of how things are going. One hundred percent success is rare, so the user may want to alter strategies and try again on the remaining traces. Eventually a few traces may have to be done manually, but the drudgery will have been bypassed.

The type of strategy used by PC-ROUTE is selected from a number of standard algorithms, including Steiner, daisy chain, short to long, long to short and others. P-CAD is one of very few systems... perhaps the only one... that is capable of mixing in forty-five degree trace paths, rather than just orthogonals. The minimum spacing between traces is also selectable, as is cost weighting for the various board features. For instance, one could set the cost weight for plate throughs at zero, thereby forbidding PC-ROUTE from adding any.

That Etching Sensation

Emerging from PC-ROUTE would be your finished board layout, ready for hard copy. Other than the printing program the only other module one would still need to call up would be PC-BACK.

PC-BACK provides "back annotation". As the circuit board is finished off and all its traces routed, it is very likely that minor changes will be made to the design. PC-BACK can take these changes upstream and incorporate them in your original schematic drawing. This level of integration is where P-CAD really endears itself to the designer.

Another powerful feature built into P-CAD is the equivalent of text outline processing. The *levl* command allows the designer to compress... *push* down... successive levels of detail into black boxes, or "functional blocks". Up to twenty levels can be compressed in this way. Levels can be exposed again by using the *pop* command. This hierarchical compression lets the designer concentrate on specific portions of a circuit. Everything else can be ignored, as long as the correct inputs and outputs are provided for each section. For instance, a chunk of circuitry could be called... say... a filter, or an oscillator, and ignored until later in the design process.

Another attractive feature of P-CAD is that it maintains a constant command history on disk. In the event of a system crash, the command history can be read in and executed. This not only regenerates your current design, it shows you how it was created. The history file can also be used to regenerate the design to an earlier stage, for instance in order to undo an entire phase of its creation. Finally, the command file... stored in a fairly readable ASCII format... can be edited, in order to modify the existing design in some subtle way. The system actually did crash once while I was taking the tour... owing to some confusion with the floppy drive. The command file regenerated the entire sample we'd been working on within just a few moments.

All in all, it seems that you get what you pay for. Telepanel itself can't quote impressive statistics regarding improvement in productivity. What it can do is to speak enthusiastically about how much smoother and neater the design process has become. Using P-CAD is like using a word processor. You may not know exactly how much faster you're working, but after a while it become hard to imagine how you ever got along without it. **CN!**

Two PC Desktop Publishing Packages

While a bit of a late arrival, desktop publishing for the PC is becoming an almost common application. Here's a dig through two pretenders to the throne.

by Frank Lenk

Unless you've been keeping your head buried several inches underground, you'll undoubtedly have heard the new catch phrase "desktop publishing". This has been good news for Macintosh owners, but a cause for some feelings of envy on the part of the IBM PC users. However, MS-DOS systems are finally closing the gap.

The availability of more moderately priced laser printers has made it worthwhile to cast about for similarly inexpensive publishing software. Professional page layout packages have been around for a while, but up in the multiple thousand dollar price range. Fortunately, a few lower cost systems have cropped up in recent months. Although they're definitely not the last word, these programs can put complete text and graphics page composition features up on your desktop PC... for no more than a few hundred bucks. They support laser printers and even get decent results out of a dot matrix machine.

In this feature we'll have a look at two of the prominent entries in this burgeoning genre. Oddly enough, this particular pair seems to demonstrate diametrically different approaches to the page layout problem.

Some New Trix

One of the most convenient and powerful graphic systems available for the IBM PC is Fontrix, from Data Transforms. Originally a simple calligraphy package for the Apple II, Fontrix is rapidly metamorphosing into a highly competent IBM page creation system.

A major step in this evolution is the introduction of Printrix, a new package from Data Transforms. Like earlier fancy printing systems, Printrix allows the user to embed extended formatting codes in word processor text files. Printrix uses the two pass method of generating near letter quality print on dot matrix printers. It also provides solid laser printing support.

The best thing about Printrix is its integration with existing Fontrix resources. Printrix can print any text file using the vast and growing selection of Fontrix fonts. It can even merge Fontrix graphics directly onto a page of text.

The biggest drawback with Printrix is getting *into* the system... particularly because the program lacks any semblance of "what you see is what you get" text or graphic display. Printrix isn't even a stand alone package:you'll need your own word processor for composing text, and you really should have Fontrix on hand if you intend to create your own graphics. Printrix is not the kind of software that you can just boot up and figure out as you go along. Even a simple Printrix job takes a certain amount of advance planning.

Luckily, Data Transforms excels at the production of lucid documentation. As with Fontrix, the Printrix manual is produced in an attractive, coherent format including both tutorial and reference sections. Its typesetting has been handled entirely by Printrix itself, giving an immediate insight into the software's capabilities. A brief section in the first chapter... "Quick Typesetting with Printrix"... gives more adventuresome souls at least a fighting chance of forging ahead on their own. However, there are many secrets to be learned before the full power of Printrix can be unleashed.

The manual's second chapter contains a series of self contained lessons in carrying out basic Printrix tasks, including printing a letter, adding font changes to a document, printing other kinds of documents and finally even creating a page with merged graphics. Each lesson deliberately repeats all the fundamentals, so you can jump to whatever task you're interested in without missing anything. The lessons are supported by a set of demonstration files, allowing you to see the Printrix commands in action without actually having to create your own document.

Creating your own formatted document is, of course, the final step in your education... but it's a big one. You'll need to read the appropriate lesson closely, then bone up in the reference chapter on specific Printrix commands. Unless you happen to be using one of the handful of explicitly supported word processing programs, you'll have to discover how Printrix will interpret your text file format. Finally, you'll have to be prepared to use up considerable quantities of paper in experimentation.

Printrix is based heavily on the idea of embedding commands in word processor text. This means that the Printrix software won't be around to provide any menus or prompts just when you'll need them the most. A substantial deficiency in the Printrix documentation is the omission of any form of quick reference... even though Fontrix, which needs it less, comes with a decent command chart.

Doing It

My own major problem starting up Printrix came from my choice of word processor. PC-Write generates pristine ASCII text files, and is therefore generally compatible with about everything you could think of... but not with Printrix.

Actually, you can use any text file, but some work better than others. Printrix explicitly supports WordStar, WordStar 2000,

WordPerfect, PFS:Write and Easy. Even with these you have to pay some attention to the file mode. For instance, in WordStar you must use the non-document mode. With WordStar 2000 you have to print to a disk file which can then be run through Printrix.

The lowest level of file compatibility is what Printrix calls "generic ASCII"... with either soft or hard returns. The hard return mode defeats Printrix's word wrapping, so it is suitable mainly for simple documents or ones where you deliberately want to lock up the line format. The generic ASCII soft return mode is what I ended up using with PC-Write. This mode allowed me to use all the Printrix features correctly, but forced me to do some rather odd things to the format of my file.

With any text format, the biggest trick is identifying the end of a paragraph. WordStar, for instance, uses the well known hard return. Printrix recognizes such marking only for the explicitly supported word processors. The generic mode requires two adjacent carriage returns to mark the end of a paragraph. Thus you'll need a blank line between paragraphs, and four blank lines where you want the document to show two blank lines.

It's important for Printrix to have a clear view of paragraph breaks, since the program likes to generate all the other formatting on its own... word wrapping, microspacing and justification. This paragraph oriented reformatting lets Printrix create a fine typeset look. The down side is that you can't easily deduce what output you'll get from any given text file. I found that multiple trials were needed for all but the simplest jobs.

The main Printrix program includes a menu driven mode highly reminiscent of its elder relation, Fontrix. It looks like this.

P Print Document
L Layout Document
N New Configuration
D Disk Access
ESC Exit Printrix System

Layout is the usual first step on the way to printing a document. A secondary menu allows you to choose text printing format, font library format, graphic printing format or header/footer format. These sound complex, but amount to little more than setting up margins, linefeeds, justification and other standard text printing parameters.

The graphic format selects horizontal and vertical magnification, placement, cropping, rotation and other parameters that will be very familiar to Fontrix users. You can also decide how text will interact with your graphic... whether it will overprint the image, or flow around it or simply break off and resume once the graphic is complete.

The font format consists of another range of Fontrix type settings, including the font library to be loaded, the spacing between letters, the linefeed spacing, the italics slope, horizontal and vertical bolding, and other special effects.

In the menu operated mode you'll be able to set all these parameters only globally. For instance, you can decide to print your document in a certain font, with an extra degree of horizontal boldface, and with headers and footers to your liking. Once you've got a combination you like... for instance, a good basic business letter... you can use another menu option to save the layout file to disk for later reuse. Thereafter you can run Printrix from the command line, specifying your text file name and the layout file.

To do anything fancy like merging a graphic you'll have to get into embedded commands. The embedded formatting commands are fairly obvious and mnemonic, once you catch on to the system. All commands are prefixed with the caret symbol and duplicate the equivalent menu commands as closely as possible. They may seem terribly complicated at first... I know they baffled me for an hour or so. Once you start working with the codes and see some results, the principles quickly become clear. As you learn the codes, setting up a simple document becomes simple enough... but I never did get to the point that things would print exactly right the first time.

Creative Constructions

With Printrix, you never do see what you're going to get until you've actually got it. Even a crude approximation available for preview would save plenty of paper.

Observe closely the sample illustration accompanying this article. This modest effort took me no less than ten tries to print out correctly, interspersed throughout several hours of dedicated fiddling. My first rough guess at a correct text file fell short in a number of ways, even though it didn't yet include the line drawing elements for the border. I fared better with the layout file, which actually required only minor fine tuning.

Several useful pointers came to me during this process.

My first suggestion is to buy a hard disk. Keeping Printrix, a decent selection of font files, your text file and the layout file all on hand can be a bit tricky on a floppy disk system.

If you must go with floppies, there a few things you can do to make life easier. First, modify the default layout file... PRINTRIX.LAY... on your working program disk. Go into the font layout menu and delete all the resident fonts. Then save the layout back to the disk. This lets you invoke Printrix without actually having any font files on hand. There are two benefits in this. Eliminating the font files leaves room on your program disk for a reasonable text editor... such as PC-Write. It also lets Printrix come up a lot faster.

In reviewing the two desktop publishing systems Printrix and Personal Publisher, a third program turned out to be of considerable assistance. Although it's not really a publishing program, Print Screen, from Domus Software in Ottawa, is quite a nice way to embellish the printed page.

There are a lot of resident printer drivers available for the PC... many of them in the public domain. One of the best is a little thing called PRTSCFX, which dumps text screens as though they were graphics... that is, verbatim, in that slightly funky IBM display font, complete with serifs and inverse text. Print Screen is much more comprehensive, giving enhanced renditions of both text and graphic displays. If nothing else, it makes IBM's own GRAPHICS.COM driver more or less redundant.

Print Screen takes a number of command line parameters, which control various aspects of the printed image. For instance, it lets you print the inverse of your screen display. This feature is perfect for doing dumps of Macintosh type fully backlit screens. Normally, dumping a screen from something like GEM or Desktop Publisher would result in the premature demise of your printer ribbon, and create a soggy grey mess on your page. With the inverse option in effect, Print Screen can dump onscreen black to printer black. The term inverse in this sense is rather misleading, since the normal IBM dump actually prints a negative image... bright text on the screen becomes black on the printed page. Without something like Print Screen, dumping black on white images is just about totally impractical.

In addition to negative image, there are four other major command line options with Print Screen. *Print* options allow you to force a graphic dump, so programs that fool the operating system... like Lotus 1-2-3, apparently... will dump properly. The *text* option can be set to recognize or ignore text attributes, and to set print orientation horizontally or vertically on the page. *Graphic* options set graphic image orientation as well as scaling. Horizontal and vertical magnification can be individually varied from factors of one through eight. Finally, *indentation* sets a number of dots to skip at the start of each line, so images can be centered on the page.

All five options can be combined. An installation program can be used to reset the default values assumed for each option.

The installation program also has some more advanced functions. It lets you completely redefine the printed character set used to dump onscreen characters, and to edit the dot patterns used to represent different screen colours.

Print Screen is a powerful and surprisingly slick little utility. I could wish for only two extensions of the existing version, to wit, a pop up control system to allow parameter changes from within applications software, and support for near letter quality printing for text. Print Screen is not exactly dirt cheap, either. However, it is well worth the money if you happen to need a sophisticated and controllable way of recording your PC screen.

The process of creating a Printrix document will involve a lot of hopping back and forth between the Printrix menu system and your text editor. Loading your layout file into Printrix will also call up all the fonts you install for the document... another reason for not bothering to load any default fonts.

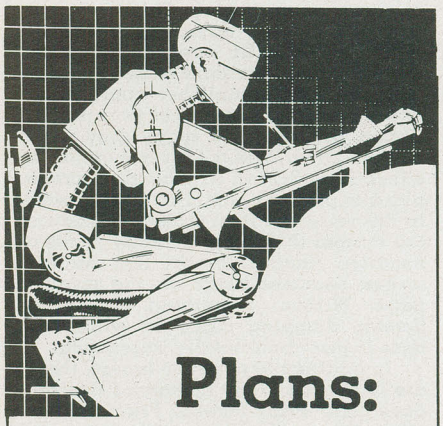
On a floppy system, the first major step in starting a document should be to ready a more or less blank disk... or better yet, create a nice roomy RAM disk. Put your text and layout files on there, and then copy in all the fonts you're going to use. With Printrix and your editor in drive A you can now survive with no further disk swaps. You'll be loading and unloading the text and fonts, so having them all together is well worth the time it takes to copy them.

The next essential step will be to create a batch file to run Printrix. There are a lot of command line options, and you won't want to remember them every time. Here's the one I used.

printrix b:1 -Lb:1.lay -Fb: -Gb: -A

This lets me specify my text file on the fly. The first three dash parameters, in order, specify the location for the layout, the font file and the graphic file. The last parameter disables Printrix's menu operation, so that the program simply prints the text file and returns to DOS.

The next stage in the process will be the most irritating. You'll need ruler, pencil and paper with which to map out a printed image. Line drawing commands in particular need some careful planning.



Plans:

Software:	**ClickArt Personal Publisher**
System:	**IBM PC**
Application:	**Desktop Publishing**
Manufacturer:	**T/Maker Co (Software Publishing)**
Availability:	**Ingram Software, 40-A Adesso Drive, Concord, Ontario L4Y 2Y1, (416) 738-1700**
Price:	**$260.95**
Software:	**Printrix**
System:	**IBM PC**
Application:	**Fancy Printing**
Manufacturer:	**Data Transforms, 616 Washington Street, Denver, Colorado 80203**
Price:	**$120.00(US)**
Software:	**Print Screen**
System:	**IBM PC**
Application:	**Screen Dump Printer Driver**
Availability:	**Domus Software Ltd., 303 Waverly Street, Ottawa, Ontario K2P 0V9, (613) 230-6285**
Price:	**$60.00**

PRINTRIX -- DEMO

Story the First

§1

The Time Traveller (for so it will be convenient to speak of him) was expounding a recondite matter to us. His grey eyes shone and twinkled, and his usually pale face was flushed and animated. The fire burned brightly, and the soft radiance of the incandescent lights in the lilies of silver caught the bubbles that flashed and passed in our glasses. Our chairs, being his patents, embraced and caressed us rather than submitted to be sat upon, and there was that luxurious after-dinner atmosphere when though runs gracefully free of the trammels of precision. And he put it to us in this way – marking the points with a lean forefinger – as we sat and lazily admired his earnestness over this new paradox (as we thought it) and his fecundity.

"You must follow me carefully. I shall have to controvert one or two ideas that are almost universally accepted. The geometry, for instance, they taught you at school is founded on a misconception."

"Is not that rather a large thing to expect us to begin upon?" said Filby, an argumentative person with red hair.

A page produced with Printrix.

You may well ask if the results are worth it. Well, Printrix certainly does do a nice job of producing fancy print... even on an antiquated old dot matrix type printer. However, the system is nowhere near as transparent as it should be. What's needed is something like a Fontrix virtual screen interface, with a graphic display of all the text and graphics as they'll actually appear on the printed page. Given that sort of interface, Printrix would not be just functional... it would be the same sort of indecent fun that Fontrix has been all along.

Personal Penmanship

Just as Printrix has evolved from Fontrix, our next entrant... the ClickArt Personal Publisher, from T/Maker... has evolved from... MacPaint. T/Maker started out supplying ClickArt collections of *clip art* graphics for the Mac. Now it has attempted to create an environment on the PC that will allow these same graphic libraries to be ported to the IBM.

By the way, T/Maker has recently arranged for Software Publishing to distribute the Personal Publisher. Although I may refer to T/Maker as authors of the product, remember to contact Software Publishing for customer type inquiries.

Personal Publisher bears more than a passing resemblance to its Macintosh ancestor. What you get is a black on white display, with an icon menu along one side and a pulldown menu bar at the top. Shrewdly enough, T/Maker has oriented the system to work best with a Hercules display adapter. The colour graphics adapter is supported, but stretches all the images vertically owing to its somewhat different pixel count.

Operating the Personal Publisher is only superficially the same as working in MacPaint. You get similar font selection and typestyle menus, but beyond that things change quite a bit. The entire system is far more text oriented. Characters tend to stick rigidly to invisible baselines... of which more in a moment... and the selection of drawing tools turns out to be quite limited. Text can't be treated as bit mapped graphics unless it is originally entered as such... and then it can never be edited as normal text.

This mode orientation results in a system that can be just as confusing as Printrix, but in just about exactly the opposite way. Printrix has a clear command structure with no visuals, while Personal Publisher has clear visuals and a mildly peculiar command structure.

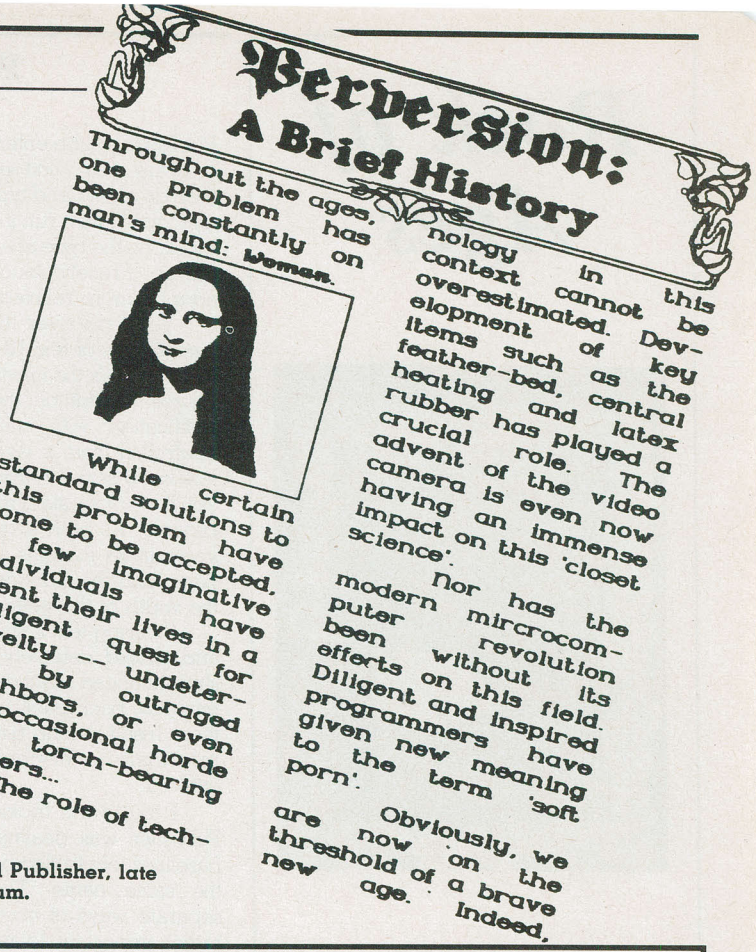
As with Printrix, there is one big step you can take to make the Personal Publisher much more transparent. Buy an AT, or a similarly zippy computer, with a hard drive.

The response times on a regular PC are not unbearable, but they are sufficiently tedious that you'll often forget what the question was by the time the answer arrives. This makes the interface a lot harder to live with than it would be otherwise. Personal Publisher works admirably well on floppies, with only an occasional disk swap... but a hard disk would definitely make it a lot more productive.

Personal Publisher also works with or without a mouse. The cursor keys can be used to control the arrow shaped cursor, and F10 replaces the mouse button. One press of F10 is equivalent to pressing the mouse button, and a second press of the key is equivalent to releasing the mouse button. This can lead to confusion, since it's easy to forget and leave yourself in the intermediate pressed state... thereby disabling all of the keyboard except the cursor keys. Once more, the best solution is to break down and buy a mouse.

Naturally, I failed to take any of this good advice. I ran Personal Publisher on a floppy disk PC, with no mouse. Its performance was bearable in the short term, but galling enough that long term users should probably consider the extra hardware an outright necessity.

The basic operation in Personal



A page with Personal Publisher, late one night in a delerium.

PC Desktop Publishing Packages

Publisher will be entering text. As with Mac software, you'd first select a font and a style, then go ahead and type your brains out. On a PC you'll then run into your first stumbling block, as the type ahead buffer immediately fills up. Frenetic touch typists will have to adopt a more relaxed pace.

You'll discover that Personal Publisher has all sorts of text handling and formatting tools. There's the inevitable cut and paste, of course. In addition, there's automatic micro-justification with multicolumn capability, controlled from a layout dialog box. Once you know about it, this box is actually where you'll want to start the document creation process. As with a good word processor, you can set margins all the way around the page, plus the number of columns and even the width of the gutter between them.

Entering text is straightforward enough, and should definitely be carried out in a straight ahead manner. The main thing is to minimize back tracking and revisions, since these result in long pauses while the system reformats everything you've already entered.

I found the trickiest thing in Personal Publisher was dealing correctly with text baselines, controlled by a pulldown menu of the same name. The menu offers four separate ways of accessing baselines. It is rather important to realize which of these should be used in what situation. *Adjust single* lets you alter baselines one at a time... for instance, to make title lines go across the full page even while the rest of the text is in multicolumn format. You'll need to watch out for overlaps among neighbouring lines, which is where the other baseline options come in. *Adjust column* controls an entire column at once. *Adjust above* and *adjust below* control all lines above or below the line you select.

All four adjust options begin by greying out your text and displaying the baselines themselves as ruled lines under the text. Selecting a baseline will show three little blocks on it, one at either end and one in the middle. Dragging an end block changes the line length, while grabbing the middle one lets you move the line up and down.

Graphics are controlled by the *art* pulldown. The major option is *get art*, which fetches a graphic from the disk. You can slide the image around, then drop it into place using the mouse button or F10. Text can be made to wrap around the graphic using a toggle on the *align* pulldown. However, I found it rather hard to predict exactly where the graphic would break the text. This meant several tries before things fell together just right, with the software pausing for a complete reformat between tries. Still, the results do pretty much justify the effort.

Sometimes a graphic won't be wide enough to blank out an entire text column. With narrow columns this leads to bizarre results... like having one letter on each line along the side of your picture. To avoid this you have to use the baselines option to shrink all the offending lines to zero length. Doing this with cursor controls requires a steady hand and an extra dose of patience.

Since Personal Publisher is not really a full featured paint system, getting graphics into it is a matter of importing them from elsewhere. T/Maker has naturally stepped in with a growing supply of clip art disks. It has also provided a convenient screen grabber utility that can snatch images from any graphics program that doesn't disable the *shift prtsc* screen dump interrupt. You can crop and scale these images before saving them to disk in a .ART Publisher file.

The clip art is supplied in Macintosh format files. Individual images from these files must be cut and saved as .ART files before you can pull them into Personal Publisher.

The available fonts are stored in a file called MASTER.FNT. On floppies you'll only have room for a dozen or so fonts... depending on their size. A font mover utility helps you to shuffle fonts in and out from library disks.

Although these procedures are a bit cumbersome, they should be reasonably painless on an AT with a hard disk. The beauty of the system is that you can port over *any* graphics or fonts from the Macintosh, giving you access to an impressive library of cheap artwork if you have a Mac at your disposal.

One Way Or Another

Personal Publisher certainly has its limitations. It loses out to Printrix on features such as auto page numbering or headers and footers. On the other hand, Printrix can't do multiple columns. Then again, Printrix can provide effects such as boldface or italics on the fly, while Personal Publisher requires you to load a separate version of each font if you want to use those effects.

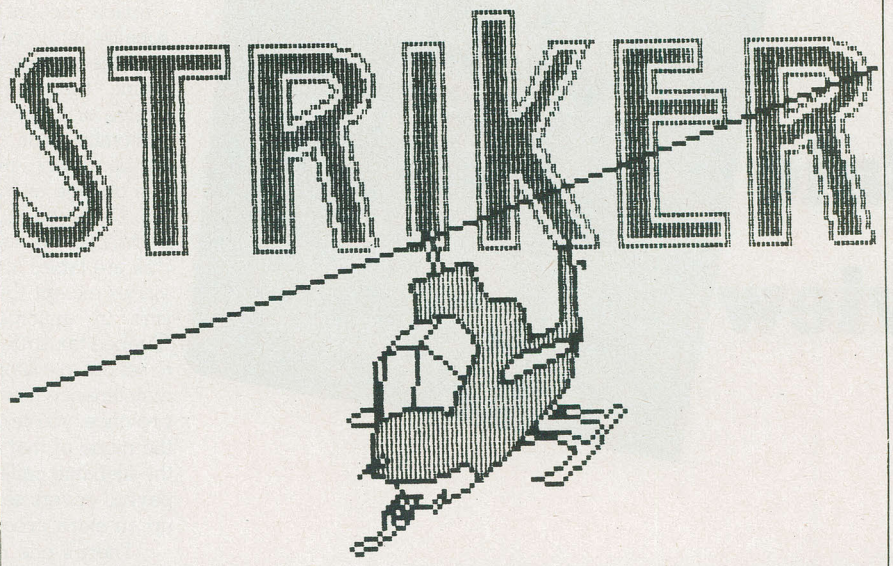
Printrix supports colour printing, if you're suitably equipped. Personal Publisher shows you exactly what you're going to get... provided you're using a Hercules card. Printrix lets you use your own word processor, and isolates layout information into a separate, reusable file. You can see the nature of the trade offs.

The pricing of the two systems is quite different, perhaps making Printrix the better buy for the bucks. However, since both systems are relatively cheap... as commercial software goes... the choice really will come down to individual situations. If you already use an AT and have easy access to Macintosh resources, Personal Publisher begins to look like a bargain. On the other hand, if you're a Fontrix buff, Printrix should be almost impossible to turn down.

The next generation of both packages should be pretty near irresistible. **CN!**

Almost Free PC Software

Volume XII



CV is a small utility to change the volume names on disks. Most humans never think to specify this when creating disks and, thereafter, it's usually unalterable. This is about six hundred bytes of salvation.

Breakout Box is an assembly language program that hides in memory and shows you what your serial ports are doing. It's the most invaluable thing going to solve your serial printer or modem glitches.

Icon Maker allows you to generate sophisticated bit mapped images with relative painlessness. It's easy to use and extremely colourful, producing data that can be incorporated into other programs.

Shell is another DOS menu program. This one is very fast, free of snow, and offers one access to virtually all the DOS features that one might want.

Striker is an experience. It's a brilliantly written helicopter game in the style of Choplifter, complete with professional high resolution graphics and running spies. This is one of the best public domain games we've ever encountered.

Ramset is a RAM expansion program from the July edition of Computing Now!. It allows one to have memory beyond the six hundred and forty kilobyte limit of the PC and to get around the long memory check time associated with lots of RAM.

TRAP is the high resolution Gemini patch program from the May edition of Computing Now!. It makes the Gemini 10x suitable for use with Personal Composer, but is easily modified to fix most bit mapped printing problems. This code requires MASM.

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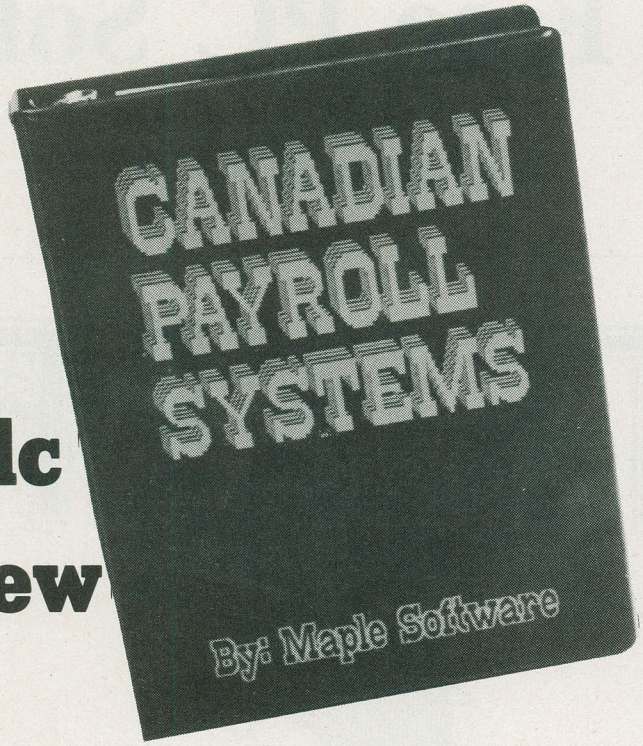
Fine print: All of this software was either written by ourselves or collected from public access bulletin boards, and is believed to be in the public domain. All of it has been tested and appears to be functional. However, we cannot assist you in modifying it to suit your individual applications.

We warrant that your disks will be readable. The post office, however, doesn't warrant anything. If you are unable to read your disks, please contact us for a prompt free replacement.

The Pay-Calc II Review



So many payroll packages are replete with custom screen, brilliant human interfaces and astounding menus but, being designed for use in the States are largely pointless north of the border. Here's one that was written for use in beaver territory.

by Bruce Evans

One of the hazards of getting known for reviewing software is that your friends expect you to know everything about every program ever written. That's how I came to review this program. A friend who runs a small service business was looking at Pay-Calc II and asked my opinion of it. Naturally I started by telling him that payroll programs weren't suitable for small businesses. It's better to let your bank do the job for you. After spending an hour with Pay-Calc II, I knew I was wrong.

Pay-Calc II makes out your payroll for hourly, salaried and commission employees. It won't be stumped by overtime, bonuses or piecework. In fact, each employee can earn any combination of these. It'll handle fifteen types of deductions including Canada pension, unemployment insurance, union dues and income tax. Use it to figure out vacation and special pays that use any, all or none of the usual deductions. Income tax deductions are calculated using Revenue Canada's own formulas.

A Taxing Situation

To run this program, you need an IBM PC or a compatible and a quarter megabyte of memory or an Apple computer and forty-eight K memory. As well, you'll need two disk drives or one disk drive and a hard disk. You'll also need an eighty column printer. This combination will let you handle a hundred employees per data disk. Naturally, you can accommodate more employees with more disks. I did my review on a Zenith 151, a PC compatible and on an Apple.

Pay-Calc II isn't copy protected. It doesn't have to be. Without the manual you'd have some trouble running it. Even though the program is menu driven and extremely user friendly, you'll want to have the manual available. However, since the program isn't protected, you can make a backup copy in case your guard dog gorfs down the original.

Let's look at the program the way I did. Put the program disk into drive A and the data disk in B. The first thing you'll see is a request for the date. Unfortunately, the program won't read your clock so you have to do this manually. On the other hand, it does give you the option of doing your payroll ahead of time with a future date. Next you'll get a maintenance and utilities menu.

The first thing you must do is to configure your setup file. This isn't difficult at all. You can customize thirteen individual portions of your program. Some, like your company name, address and revenue Canada account number are needed to personalize your printouts. Others determine how the program functions. It takes into account, for example, whether you have twelve or fifty-two pay periods. Still others customize your printer output. Don't worry about making mistakes at this stage. You can change anything later on.

Next you must tell the program which provincial tax table to use. On your data disk are tables for all the territories and provinces except Quebec. This latter omission isn't in anticipation of separation: the Quebec tax structure is just too complicated to set out in a simple table. Merely follow the maintenance menu and give the name of the province you're in. The program changes the name of that file to TAXDATA which is the filename called by the program. If your payroll covers several provinces, just make up an extra program disk.

There's one more step before you can actually make up your first payroll. You must create a data file for your employees. You'll have to do this only once. At year's end, you can use the program's MOVE command to transfer all this data to next year's disk. Your manual contains a sample worksheet to let you figure out all possible employee information before entering it into the computer. Here's where I found one of the very few errors in the manual. Page 6.1 of the manual refers you to appendix A to get his worksheet. In fact, it's appendix C.

There are sixteen "mandatory" fields. These include employee number, name and social insurance number as well as regular and overtime pay rates. Several, such as vacation pay and dues aren't really mandatory but they're included in this group.

Much of the versatility of this program comes in the eight optional deductions. These can include use of a company car, board and lodging, low rent housing and that perennial favourite, "other". These may be further classified as taxable or non-taxable and as deductions or additions to pay.

After you've entered all your data, Pay-Calc II will make the calculations and output the results according to your earlier choices. The first few times, you'll probably want to check it on your screen so you can be sure everything is functioning properly. After a while, you'll be able to just post it to your year-to-date file and send it to your printer. Even if you make a mistake here, you can make corrections and reverse the

posted data. Pay-Calc II will even remind you if you've forgotten to back up your data or do postings.

Other Functions

Unfortunately, paying your employees isn't the end of your obligations as an employer. Pay-Calc II recognizes this. It'll print out year-to-date forms for employees that are leaving you. This will include the "last twenty periods of insurable employment" required by the unemployment insurance commission. You can also get a company year-to-date report with totals in each individual category for your own accounting. Next, the program will print out remittance reports at the end of each month with the amount you must pay Canada pension and unemployment insurance. Your data disk has the current employer multipliers but you have the option of changing these default values. Finally, and this is why my friend wanted a payroll program, Pay-Calc II will print out your T-4 forms for each employee at the end of the year.

```
                P A Y - C A L C   II
                   (MAIN MENU)

      PROCESS                          MAINTENANCE
      =======                          ===========
1 ENTER CREDITS                  7 DIRECT DATA ENTRY
2 PAY RUN                        8 EMPLOYEE NAMELIST
3 TIMECARDS                      9 CONFIGURE

      REPORTS                          UTILITIES
      =======                          =========
4 REMITTANCE REPORT              10 T4.PRINTER
5 EMPLOYEE Y.T.D.                11 YEAR-END
6 COMPANY Y.T.D.                 12 BACKUP

                  SELECT ..
                (or enter `END')
```

These are the nuts and bolts of this program. However, there's more. What happens if your troll keeper is off for six months maternity leave? Simply use the delete command and her name won't come up at pay time. However, her record is still on file so you'll still be able to make T-4 forms and keep all your other records. When she comes back, just undelete her and you're back in action.

What happens if an employee's data changes? He might get married, have extra tax deductions or even get a raise. No problem. The file maintenance routines let you change this information in a wink. What happens if you make an error somewhere along the way? That's easy too. You can insert corrections or deletions directly into the year-to-date records and data files.

It all sounds good so far, but what about the person with no computer training. Won't he have trouble running this program? No. It's one of the most user friendly business programs I've come across. It's menu driven. Each menu leads to another until you've reached the process you need. Each of these menus is illustrated in the manual. In addition, there's a flow chart showing all these menus and their interrelations. You couldn't get lost if you tried.

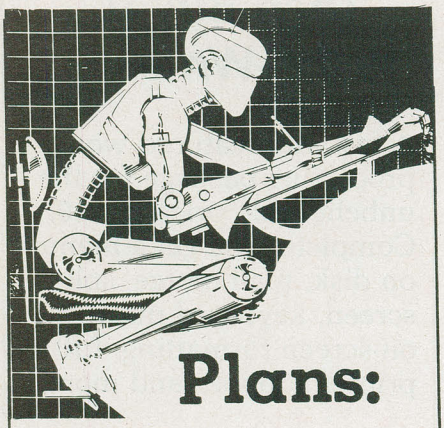
The users' manual for Pay-Calc II is a gem of technical writing. I use a copy of it as a model for my community college class. It's even easier to use than the program. You get a three ring binder with all it's pages numbered by section. To direct you to the right page, there's a section index at the front and a cross referenced topic index at the back. If you have any problems while running the program, the help prompts direct you to the correct page.

There are helpful footnotes in the program itself. These fill the bottom three or four lines of each menu screen. If you're in doubt about what to do, these prompts should be enough to get you going. If they're not, there's a reference to the appropriate page in the manual. As you become more at home with Pay-Calc II, you can reconfigure the setup file to leave out these footnotes. Personally, since they don't affect the program and use space that's otherwise not used, I can't see why I'd want to turn them off. After all, we all have lapses in memory. They'd be invaluable if someone not fully familiar with the program had to fill in making up payrolls during the vacation or illness of your book keeper.

You're probably wondering what happens when Revenue Canada decides to change its tax rates. No problem. There are two solutions. Maple Software makes new tax tables available to its dealers whenever there are changes. You can buy them at a reasonable cost. Alternatively, in the Apple version only, there's a clearly worded description of how you can make these changes yourself. You can save yourself a few bucks that way. I wish the IBM version had this option.

I mentioned earlier that you can run Pay-Calc II from a hard disk. There's a batch file on the distribution disk to set this up. Run HDPAY and the program will move a batch file to your root directory on the

The Pay-Calc II Review



Plans:

Software: **Pay-Calc II**
Systems: **IBM-PC and compatibles; Apple II, IIe, II+ and III**
Application: **Canadian payroll program**
Availibility: **Maple Software, 38 Inniswood Drive, Scarborough, Ont. M1R 1E5, (416) 757-1729**
Price: **$495**

hard disk. Next it creates a directory called PAYCALC and proceeds to copy all your program and data files to that directory. To run your payroll, all you need to do is to log onto drive C and enter, PAYCALC. Don't forget, though, the program disk must still be in drive A as a security measure.

I am somewhat uneasy with lack of security in Pay-Calc II. Utility routines to modify year-to-date and employee data files are right in the program. What's to stop an employee from increasing his pay rate or changing his tax deductions to show that he's paid more tax than he actually has? If you're always running the program at home by yourself, this isn't a problem. If your system is on your desk at work, it could be. I'd like to see any routines to modify files in a separate program.

I'm always happy to see good Canadian written business software. Although the price sounds steep, I'm sure you'd save enough bookkeeping time to pay it back in less than a year. I told my friend to buy it and now I'm running my own office payroll on it. **CN!**

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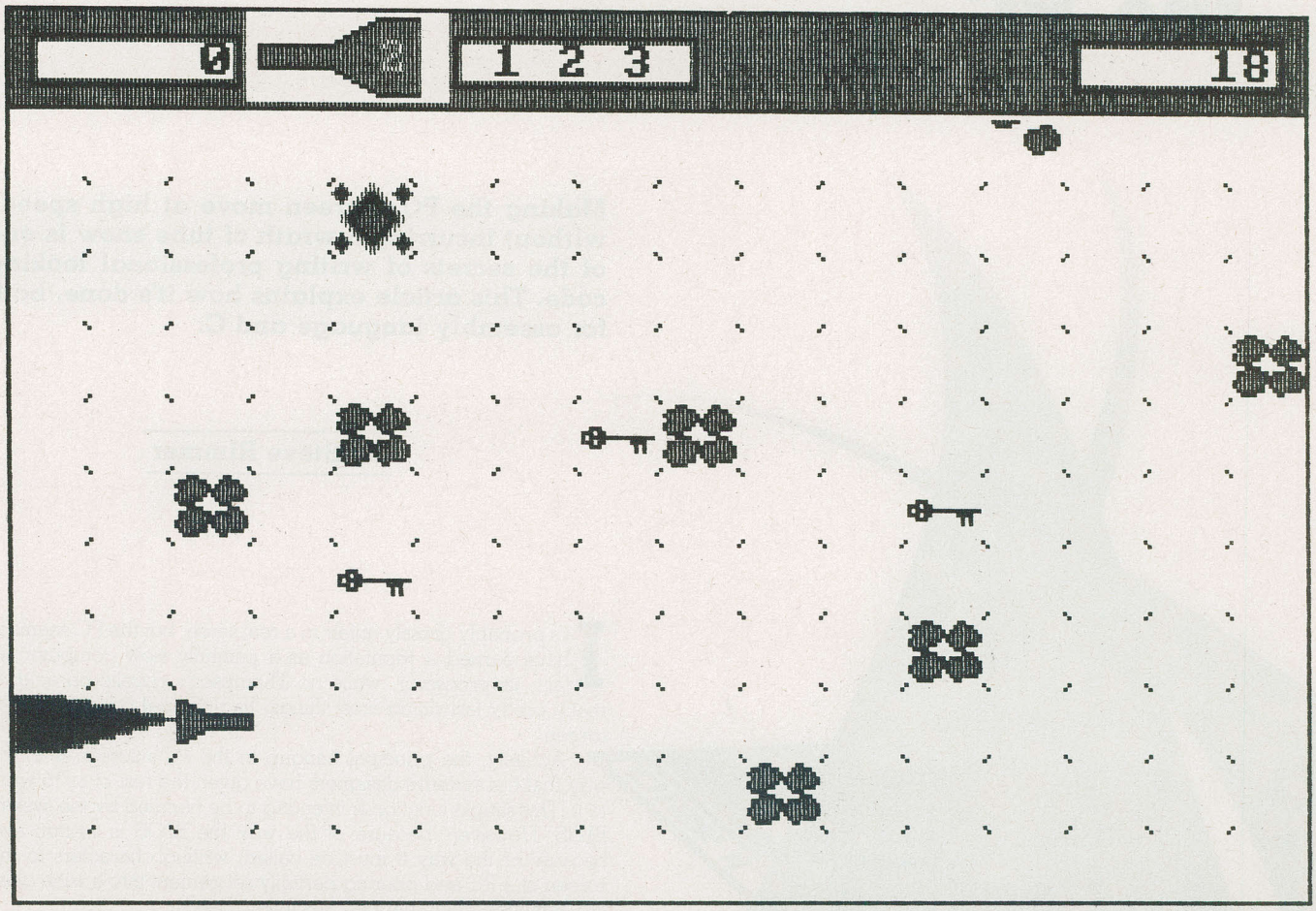
Volume XV

Programs to Blow Up Your Monitor With



There is a lot of good stuff on this disk... but most important, there are two dynamite games herein. We could get into the graphics package, the CP/M emulator, the fractal program in C... however, it's the games that do it. Plan to lose at least a weekend over this one.

Altamira is one of the nicest public domain paint box programs available for the PC. Unlike most of the so called graphics packages available for the PC, this one isn't restricted to doing bar charts and graphs. It does first rate pictures. Requires a colour card.

Fractal is the source code for the fractal generator in C that we looked at in the August edition of Computing Now!. It's useful even if you don't like fractals, as it illustrates the use of high resolution graphics in C. Requires a C compiler and a colour card.

NEMON is a really weird game. You get stuck in the catacombs of king Nemon with nothing more than your wits and a flashlight. You have to find some keys, some treasures and, hopefully, a way around a host of arcade game nasties.

Thor used to be the god of thunder. Now he appears to be the world's most sophisticated desk calendar program. He'll remind you of appointments, keep track of your agenda and do things that would usually require a host of low tech objects, like pencils and note pads.

Round 42 is a wholly bizarre variation on the theme of space invaders. No longer the dusty arcade game that it once was, this thing breathes new and rather ichorous life into the ceaseless battle between you and the phospor aliens. This is one of the best computer games in creation. Requires a colour graphics card.

V20 is a CP/M emulator for users of the NEC V20 chip. Replace your existing 8088 with a V20, score this little program and most CP/M software will run on your system as if someone had stolen half the bits out of your PC. Regular MS-DOS isn't affected. Requires a V20.

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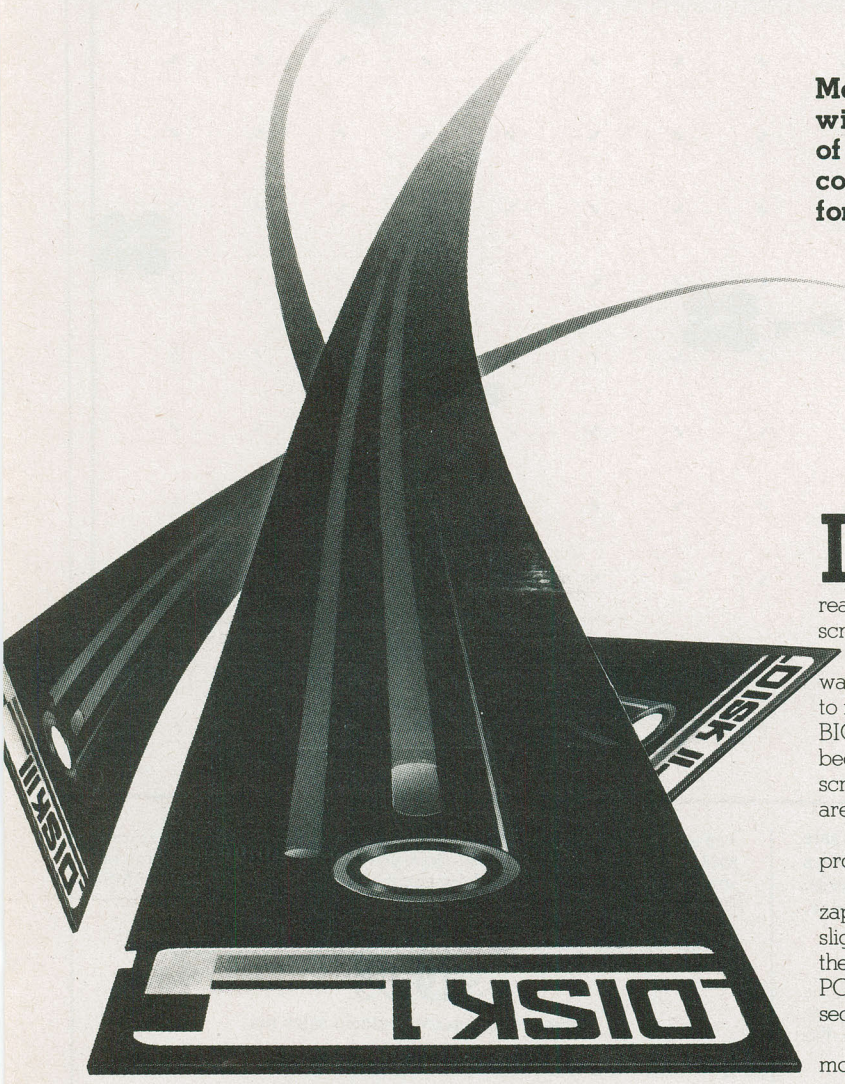
High Speed Video for the PC



Making the PC's screen move at high speeds without incurring a wrath of tube snow is one of the secrets of writing professional looking code. This article explains how it's done, both for assembly language and C.

by Steve Rimmer

It's probably grossly unfair in a real sense, but the PC seems to have earned a reputation as a painfully slow computer. In fact, its processor, while no Thompson's gazelle on acid, is really pretty fast doing most things. Its principal hangup is in its screen.

Actually, the principal hangup in the PC's screen is in the way that the system's designers have given the rest of us to write to it. This simple function is intended to be handled by the system BIOS. However, because of the way the BIOS is written and because of the way it must be called, writing characters to the screen of a PC and pouring partially set cement into a wine glass are activities which happen at similar speeds.

This is one of the primary things that likes to make hand made programs look funky and amateurish.

If you've ever seen professional application software which zaps things onto the tube in the blink of a gnat's eye without the slightest suggestion of screen snow you've probably wondered if there wasn't some secret way of getting around the tedium of the PC's screen drivers. Not surprisingly, there are indeed a few secrets in there... we're going to check them out in this feature.

The listing in this article will create a relocatable object module which can be used with either assembly language programs or C code to handle your PC's screen at speeds that would make the Enterprise at warp nine look like a Honda Civic running into the wind.

The Curse Of Interrupts

As most programmers learn eventually, the PC's screen is actually a chunk of memory right on the bus... just like the rest of the system memory... which can be accessed by reading and writing to it. You can see this work from BASIC, if you want to. Try this little program

```
10 DEF SEG = &HB800
20 FOR X = 0 TO 160 STEP 2
30 POKE X,65
40 POKE X+1,2
50 NEXT
```

This will print a line of green As along the top of your screen. Notice it does so without the use of a print statement.

There are a number of other things to look at in this little bit of code. First of all, it will only work for a colour card. If you have a monochrome card or a Hercules card you'll have to change line ten to read

```
10 DEF SEG = &HB000
```

This is one of the first catches in writing our own screen driver... the screen buffer doesn't always live in the same place. In fact, even in the colour card there are four text pages, any one of which can be active. Each page occupies a different chunk of memory. In planning to write directly to the screen memory we have to know what part of the memory is actually being displayed by the PC as screen data.

The next thing you might have noticed about this little BASIC program is that the screen sparkles with little coloured lines when you run it... assuming, again, that you run it on a colour card. This happens whenever one tries to read or write to the screen buffer at the wrong times. Unfortunately, almost any time is the wrong time for the PC. In order to avoid the snow, we have to wait for the scan retrace of the PC's video circuitry, that is, for the moment when the screen is actually shut down. At this point there is just enough time to jam one character into the buffer without disturbing the PC. Unfortunately, you can't get this together from BASIC... or even from C. It has to happen very, very quickly, which is why the basis of the code we're going to look at is in assembler.

The final thing of interest here is a bit of insight into the way in which characters are displayed by the PC. The system keeps its character memory... the actual letters and numbers... and its attribute memory... the colours they turn up in... interleaved in the same RAM space. The odd numbered bytes are characters, the even numbered ones their corresponding attributes. As such, one line of an eighty column screen occupies a hundred and sixty bytes.

We could write an assembler language program fragment to do what the BASIC routine did.

```
        MOV     AX,0B800H
        MOV     ES,AX
        MOV     CX,160
        MOV     DI,0
        MOV     AX,0241H
LABEL:  MOV     ES:[DI],AX
        ADD     DI,2
        LOOP    LABEL
```

Actually, we could have done this with string move instructions, but this way's a bit more readable. If you run this little bit of code you'll find that the string of green As will appear at the top of your screen virtually instantly. The snow, however, will be pretty thick for a second. The faster one slams data into the screen buffer, the worse the snow gets.

If you look at the main program that goes with this article, you'll find a routine called PRINT that can achieve screen printing speeds almost as fast as our little chunk of code, but without the merest flicker of screen snow.

The PRINT routine will take a word pushed up onto the stack and store it at the current cursor location on the screen. For the best results, the low order byte of the word should be the character we want to see and the high order byte the attribute we want to see it displayed with. This is a typical call to PRINT

```
MOV     AL,'A'
MOV     AH,02H
PUSH    AX
CALL    PRINT
POP     AX
```

I know... this call looks a bit funny. We'll get to just why it's done this way in a second.

```
        COMMENT -

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                -

FALSE           EQU     0
TRUE            EQU     NOT FALSE

LONG_           EQU     FALSE           ;SET TRUE FOR FAR CALLS

                IF      LONG_
A_OFF           EQU     6
                ELSE
A_OFF           EQU     4
                ENDIF


DGROUP          GROUP   DATA
DATA            SEGMENT WORD PUBLIC 'DATA'
                ASSUME  DS:DGROUP

DATA            ENDS

PGROUP          GROUP   PROG
PROG            SEGMENT BYTE PUBLIC 'PROG'
                ASSUME  CS:PGROUP

;THIS ROUTINE READS SCREEN MEMORY INTO A BUFFER
;
;               CALLED AS
;               read_buffer(l,b);
;               int l;  /* number of words in buffer to read */
;               char *b;

                PUBLIC  READ_BUFFER
                IF      LONG_
READ_BUFFER     PROC    FAR
                ELSE
READ_BUFFER     PROC    NEAR
                ENDIF

                PUSH    BP
                MOV     BP,SP
                MOV     CX,[BP + A_OFF]     ;LENGTH
                MOV     SI,[BP + A_OFF + 2] ;POINTER TO BUFFER

                PUSH    DS
                PUSH    ES
                MOV     DX,DS               ;SAVE DATA SEGMENT
                MOV     AX,0040
                MOV     DS,AX               ;FUDGE DATA SEGMENT

                CALL    S_SEGMENT           ;GET THE SCREEN SEGMENT
                MOV     ES,AX               ;INTO ES
                CLD

READ_B1:        PUSH    CX

                MOV     AX,0040H
                MOV     DS,AX
                PUSH    DX
                CALL    POSITION            ;GET THE OFFSET INTO
                                             THE BUFFER
                INC     BYTE PTR DS:[0050H] ;BUMP THE SCREEN
                                             POINTER
                MOV     DX,DS:[0063H]       ;GET THE CRTC REGISTER
                ADD     DX,6

READ_B2:        IN      AL,DX
                TEST    AL,1
                JNZ     READ_B2
                CLI

READ_B3:        IN      AL,DX
                TEST    AL,1
                JZ      READ_B3             ;WAIT FOR THE RETRACE

                MOV     AX,ES:[DI]
                POP     DS
                MOV     DX,DS
                MOV     [SI],AX
                STI
```

The PRINT code is really quite complicated for something that just puts a couple of bytes on the tube. If you check it out in detail, however, you'll be able to understand more or less what it's up to.

The memory segment at 0040H is where the BIOS stores its various bits of scratch data. There are a number of useful things down there. For example, at 0010H there is a word which describes the equipment that's installed in the PC. If you look at the code S_SEGMENT you'll see how this byte can be read to check out which sort of display card is in the system. If we know this, we will know whether the screen segment we have to poke bytes into is 0B000H for a monochrome or Herc card, or 0B800H for a colour card.

The first thing the PRINT code does is to get the screen segment into ES with this routine.

The POSITION routine reads the cursor position in X and Y co-ordinates and works out the number of bytes into the screen buffer it represents. I've taken a few liberties here... we'll assume that all printing to the colour card is done on page zero. Taking care of all four pages would have required additional code which would have slowed things down a bit. Actually, you can eliminate the screen segment code too, if you know which sort of card you'll be running your program with, buying a bit more speed.

The value at 0040:0063H is the base port of the video controller. Six ports beyond there lives a byte which can be read to determine the beginning and end of each screen scan line. Check out the code at PRINT_1. The first bit of this port will get pulled when the line is scanning and unpulled when it stops for its retrace. By waiting for both these events we can determine when it's safe to update the screen buffer.

The time during which the screen can be written to without bringing about the onset of winter is very short indeed. In fact, simply MOVing data into the buffer won't cut it. The STOSW instruction is faster than a complex MOV by several machine cycles. As such, we can use it to update the buffer in the shortest possible time.

Answering The Call

The peculiar calling convention of this set of routines is largely owing to their ancestry. I wrote them to be called from C language programs. In fact, they don't much care whether you use them from C or assembler... they're equally applicable to each.

The calling convention from C may look a bit cumbersome to machine language programmers, but it does have its advantages. Rather than passing parameters to a subroutine by loading them into registers... which limits the number of arguments to the number of available registers... under C we pass them by pushing them onto the stack. The subroutine reads the numbers off the stack... you can see how it does this with the BP register in the PRINT routine... and does what it wants to with them. After the call is complete the calling code pops the arguments off the stack.

If a subroutine is to return a value, by convention, it's returned in AX.

Under C, of course, a call to PRINT would be extremely simple

```
print('A' + 2 << 8);
```

The value passed to PRINT in this line is the character to be printed, the ASCII value of A plus the attribute, two, rotated into the high order byte.

The machine language module here contains a whole collection of tools to manipulate the PC's screen without having to resort to BIOS calls, which are all pitifully slow. The first two routines, READ_BUFFER and PRINT_BUFFER, handle chunks of screen data, and are primarily useful for moving it around. The READ_BUFFER code will copy data from the current cursor location into a buffer.

```
                POP     CX
                ADD     SI,2
                LOOP    READ_B1

                MOV     AX,0040H                ;SET DATA SEGMENT
                MOV     DS,AX
                CALL    POSITION                ;GET BUFFER OFFSET

                MOV     CX,AX                   ;ADJUST REAL CURSOR
                SAR     CX,1
                MOV     AH,14
                CALL    OUT6845

                POP     ES
                POP     DS
                POP     BP
                RET
READ_BUFFER     ENDP

;THIS ROUTINE PRINTS A BUFFER
;
;               CALLED AS
;               print_buffer(1,b);
;               int l;  /* number of words in buffer to print */
;               char *b;

                PUBLIC  PRINT_BUFFER
                IF      LONG_
PRINT_BUFFER    PROC    FAR
                ELSE
PRINT_BUFFER    PROC    NEAR
                ENDIF

                PUSH    BP
                MOV     BP,SP
                MOV     CX,[BP + A_OFF]         ;LENGTH
                MOV     SI,[BP + A_OFF + 2]     ;POINTER TO BUFFER

                PUSH    DS
                PUSH    ES
                MOV     DX,DS                   ;SAVE DATA SEGMENT

                MOV     AX,0040
                MOV     DS,AX                   ;FUDGE DATA SEGMENT

                CALL    S_SEGMENT               ;GET THE SCREEN
                                                 SEGMENT
                MOV     ES,AX                   ;INTO ES
                CLD

PRINT_B1:       PUSH    CX

                MOV     DS,DX                   ;RESTORE PROGRAM
                                                 DATA SEGMENT
                MOV     AX,[SI]                 ;GET NEXT WORD TO
                                                 HANDLE
                PUSH    DX
                PUSH    AX                      ;AND SAVE IT

                MOV     AX,0040H
                MOV     DS,AX
                CALL    POSITION                ;GET THE OFFSET INTO
                                                 THE BUFFER
                INC     BYTE PTR DS:[0050H]     ;BUMP THE SCREEN
                                                 POINTER

                POP     BX
                MOV     DX,DS:[0063H]           ;GET THE CRTC
                                                 REGISTER
                ADD     DX,6

PRINT_B2:       IN      AL,DX
                TEST    AL,1
                JNZ     PRINT_B2
                CLI

PRINT_B3:       IN      AL,DX
                TEST    AL,1
                JZ      PRINT_B3

                MOV     AX,BX
                STOSW
                STI
```

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```
char buffer[64];

gotoxy(10,5);
read_buffer(32,buffer);
```

This bit of code will move the cursor to character ten on the line five on the screen and read the next thirty-two characters and their attributes into the area defined by *buffer*... the first argument is the number of words to read into the buffer in the second. Note that the buffer has to be twice as long as the number of characters one is interested in as it has to hold that many words, rather than bytes.

The *gotoxy( )* function, which we'll get to shortly, just changes the cursor position.

There are a number of interesting thing happening in READ BUFFER. The most notable of these is that the cursor position doesn't change until the read is complete. In other words, we scoop all the characters and then move the cursor to agree with the end of the area that has been read. This saves quite a few instructions, and speeds up the code.

The cursor one normally sees on the screen is actually put there by the 6845 video controller chip on whatever display board you have in your PC. As such, we have to position it, ultimately, by sending data to the chip. This is handled by the

```
                POP     DX
                POP     CX
                ADD     SI,2
                LOOP    PRINT_B1

                MOV     AX,0040H                ;SET DATA SEGMENT
                MOV     DS,AX
                CALL    POSITION                ;GET BUFFER OFFSET

                MOV     CX,AX                   ;ADJUST REAL CURSOR
                SAR     CX,1
                MOV     AH,14
                CALL    OUT6845

                POP     ES
                POP     DS
                POP     BP
                RET
PRINT_BUFFER    ENDP

;THIS ROUTINE POSITIONS THE CURSOR
;
;               CALLED AS
;               gotoxy(x,y);
;               int x,y;
;
                PUBLIC  GOTOXY
                IF      LONG_
GOTOXY          PROC    FAR
                ELSE
GOTOXY          PROC    NEAR
                ENDIF

                PUSH    BP
                MOV     BP,SP
                MOV     BX,[BP + A_OFF]         ;X POSITION
                MOV     CX,[BP + A_OFF + 2]     ;Y POSITION

                PUSH    DS
                MOV     AX,0040H
                MOV     DS,AX

                MOV     AL,BL
                MOV     AH,CL

                MOV     DS:[0050H],AX
                CALL    POSITION

                MOV     CX,AX
                SAR     CX,1
                MOV     AH,14
                CALL    OUT6845

                POP     DS
                POP     BP
                RET

OUT6845:        MOV     DX,DS:[0063H]
                MOV     AL,AH
                OUT     DX,AL
                INC     DX
                MOV     AL,CH
                OUT     DX,AL
                DEC     DX
                MOV     AL,AH
                INC     AL
                OUT     DX,AL
                INC     DX
                MOV     AL,CL
                OUT     DX,AL
                RET

GOTOXY          ENDP

;THIS ROUTINE TURNS OFF THE CURSOR
;
;               CALLED AS
;               NoCursor();
;

                PUBLIC  NOCURSOR
                IF      LONG_
NOCURSOR        PROC    FAR
                ELSE
NOCURSOR        PROC    NEAR
                ENDIF
```

routine OUT6845... you can see how it's called at the end of READ_BUFFER. It's also worth noting that the memory locations in segment 0040H that specify the cursor position aren't set by the 6845... you have to make sure they agree with where we've told the video controller to put the cursor. This can get a bit messy if you're too cavalier with them.

The PRINT_BUFFER routine prints the contents of the current buffer to the screen at the current cursor position, the opposite of READ_BUFFER. It's called in the same way. Usually, one loads a buffer from one part of the screen with READ_BUFFER and prints it elsewhere with PRINT_BUFFER. These two routines are especially useful if you want to scroll a chunk of the screen up or down very quickly.

As with the rest of these routines, these things can be called from assembly language programs without any heavy sweat. This code fragment is the equivalent of the C call to READ_BUFFER.

```
        MOV     DX,OFFSET BUFFER
        PUSH    DX
        MOV     AX,32
        PUSH    AX
        CALL    READ_BUFFER
        POP     AX
        POP     DX
        ...
BUFFER: DW      32
```

You'll want to have some code where the three dots are to avoid having your program try to execute the buffer, of course.

The GOTOXY routine, as I said, positions the cursor. It does pretty well what the BIOS does, but it does it without the lengthy process of an interrupt call. It updates the 0040H segment location values and sends the data to the video controller to actually move the cursor. If you wanted to call it from machine language you'd have to push two values onto the stack, the first being the X position and the second the Y position.

The cursor routines... NOCURSOR, BIGCURSOR and DOSCURSOR... change the shape of the cursor, NOCURSOR killing it entirely. If you want a different sort of cursor, you can create your own with SETCURSOR. The argument for it should be an integer such that the start line of the cursor is the low order byte and the end line the high order byte. The GETCURSOR routine returns the current cursor value in this format.

These routines also stand in for functions of the BIOS, but they're very much faster. It's frequently useful to save the existing cursor value, turn off the cursor to do something on the screen and then restore the previous cursor.

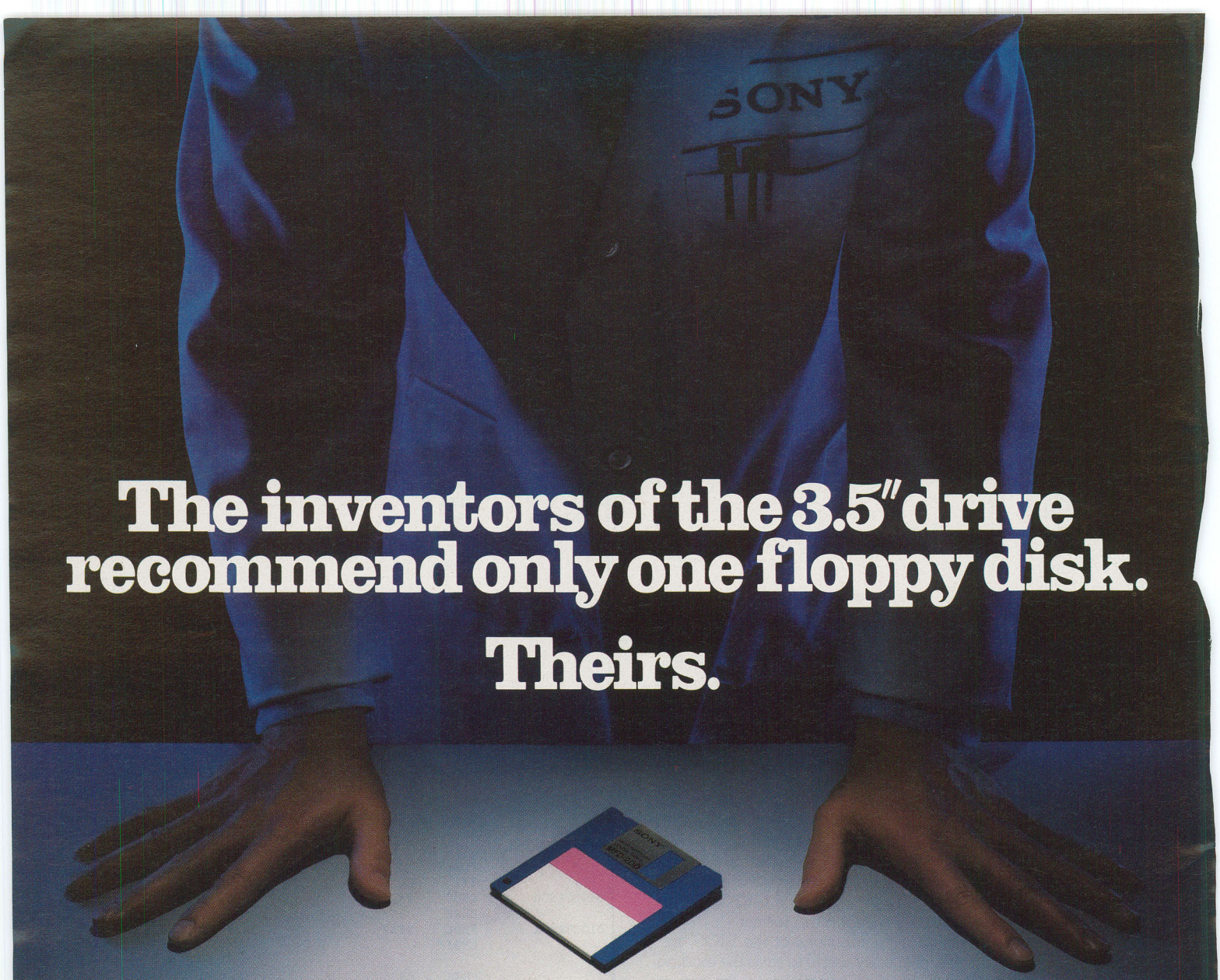
The final function in this chunk of code is SCREEN_SEGMENT, which returns the segment address of the screen... perhaps not surprisingly. This will either be 0B000H or 0B800H, depending on what sort of card you're using. It doesn't consider EGA cards. While this function isn't strictly speaking necessary to use the rest of this module, it is a handy thing to have at times. Again, you can get it together by calling an interrupt, but the procedure and its subsequent bit manipulation is cumbersome in C.

Practical Applications

You can use this code for just about anything you'd currently use the BIOS or DOS functions for... that would be *int86( )* and *intdos( )* from C. For example,

```
PrintString(s,x,y)
        char *s;
        int x,y;
{
        int c;

        while((c = *s++) != 0) {
                GotoXY(x,y);
                Print(c);
                ++x;
        }
}
```

```
                PUSH    DS

                MOV     AX,0040H
                MOV     DS,AX
                MOV     CX,0F0FH
                MOV     DS:[0060H],CX
                MOV     AH,10
                CALL    OUT6845

                POP     DS
                RET
NOCURSOR        ENDP

;THIS ROUTINE TURNS ON A DOS CURSOR
;
;               CALLED AS
;               DosCursor();
;

                PUBLIC  DOSCURSOR
                IF      LONG_
DOSCURSOR       PROC    FAR
                ELSE
DOSCURSOR       PROC    NEAR
                ENDIF

                PUSH    DS

                MOV     AX,0040H
                MOV     DS,AX
                MOV     CX,0607H
                MOV     DS:[0060H],CX
                MOV     AH,10
                CALL    OUT6845

                POP     DS
                RET
DOSCURSOR       ENDP

;THIS ROUTINE TURNS ON A BIG CURSOR
;
;               CALLED AS
;               BigCursor();
;

                PUBLIC  BIGCURSOR
                IF      LONG_
BIGCURSOR       PROC    FAR
                ELSE
BIGCURSOR       PROC    NEAR
                ENDIF

                PUSH    DS

                MOV     AX,0040H
                MOV     DS,AX
                MOV     CX,0307H
                MOV     DS:[0060H],CX
                MOV     AH,10
                CALL    OUT6845

                POP     DS
                RET
BIGCURSOR       ENDP

;THIS ROUTINE SETS THE CURRENT CURSOR MODE
;
;               CALLED AS
;               SetCursor(c);
;               int c;
;

                PUBLIC  SETCURSOR
                IF      LONG_
SETCURSOR       PROC    FAR
                ELSE
SETCURSOR       PROC    NEAR
                ENDIF

                PUSH    BP
                MOV     BP,SP
                MOV     CX,[BP+A_OFF]

                PUSH    DS
```



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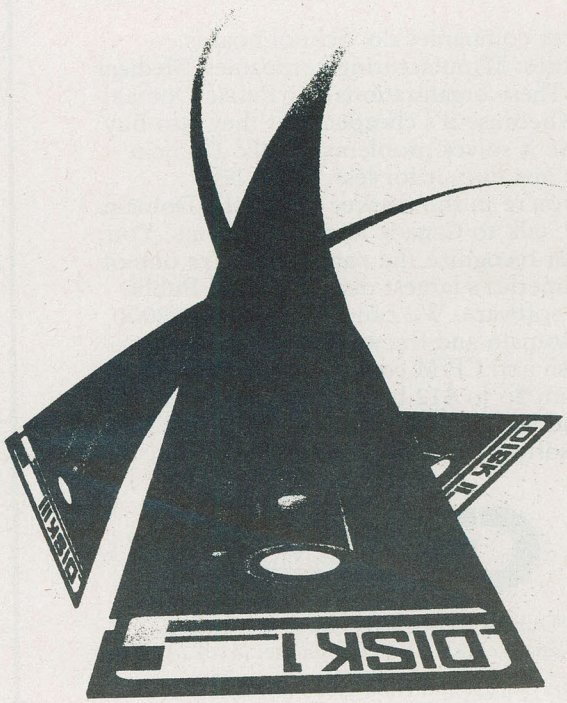
```
                MOV     AX,0040H
                MOV     DS,AX
                MOV     DS:[0060H],CX
                MOV     AH,10
                CALL    OUT6845

                POP     DS
                POP     BP
                RET
SETCURSOR       ENDP

;THIS ROUTINE RETURNS THE CURRENT CURSOR MODE
;
;               CALLED AS
;               c = GetCursor(c);
;               int c;

                PUBLIC  GETCURSOR
                IF      LONG_
GETCURSOR       PROC    FAR
                ELSE
GETCURSOR       PROC    NEAR
                ENDIF

                PUSH    DS
                MOV     AX,0040H
                MOV     DS,AX

                MOV     AX,DS:[0060H]

                POP     DS
                RET

GETCURSOR       ENDP


;THIS ROUTINE PRINTS A CHARACTER AT THE CURRENT SCREEN LOCATION
;
;               CALLED AS
;               print(c);
;               int c;

                PUBLIC  PRINT
                IF      LONG_
PRINT           PROC    FAR
                ELSE
PRINT           PROC    NEAR
                ENDIF

                PUSH    BP
                MOV     BP,SP
                MOV     CX,[BP+A_OFF]

                PUSH    ES
                PUSH    DS

                MOV     AX,0040H
                MOV     DS,AX
                CALL    S_SEGMENT
                MOV     ES,AX

                CALL    POSITION

                MOV     DX,DS:[0063H]
                ADD     DX,6

PRINT_1:        IN      AL,DX
                TEST    AL,1
                JNZ     PRINT_1
                CLI

PRINT_2:        IN      AL,DX
                TEST    AL,1
                JZ      PRINT_2

                MOV     AX,CX
                STOSW
                STI

                POP     DS
                POP     ES
                POP     BP

                RET

POSITION:       MOV     AX,DS:[0050H]
                MOV     BX,AX
                MOV     AL,AH
                MOV     DH,BYTE PTR DS:[004AH]
                MUL     DH
                XOR     BH,BH
                ADD     AX,BX
                SAL     AX,1
                MOV     DI,AX
                RET

S_SEGMENT:      MOV     AX,DS:[0010H]
                AND     AX,30H
                CMP     AX,30H
                JNE     COLOUR_CARD
                MOV     AX,0B000H
                RET
COLOUR_CARD:    MOV     AX,0B800H
                RET

PRINT           ENDP

;THIS ROUTINE RETURNS THE CURRENT SCREEN SEGMENT
;
;               CALLED AS
;               s = screen_segment();
;               unsigned s;

                PUBLIC  SCREEN_SEGMENT
                IF      LONG_
SCREEN_SEGMENT  PROC    FAR
                ELSE
SCREEN_SEGMENT  PROC    NEAR
                ENDIF
                PUSH    DS
                MOV     AX,0040H
                MOV     DS,AX
                CALL    S_SEGMENT
                POP     DS
                RET
SCREEN_SEGMENT  ENDP

PROG            ENDS
                END
```



High Speed Video for the PC

This will print the string *s* at location *x,y*. You will probably find that it's handy to have a large global scratch buffer defined in your programs, so that, for example, you can use *sprintf( )* and a function like this one to get the equivalent of *printf( )* at higher speeds.

```
sprintf(scratch,"There were %d wombats",i);
PrintString(scratch,10,4);
```

For those heads who haven't had to use external object modules like this one before, it might be worth having a quick shot at the linking procedure before we scoot. If you are going to use this code with an assembly language program, you should put this stuff at the top of your source file.

```
EXTRN NEAR:READ_BUFFER, NEAR:PRINT_BUFFER
EXTRN NEAR:GOTOXY, NEAR:NOCURSOR
EXTRN NEAR:NOCURSOR, NEAR:BIGCURSOR
EXTRN NEAR:DOSCURSOR, NEAR:SETCURSOR
EXTRN NEAR:GETCURSOR, NEAR:PRINT
EXTRN NEAR:SCREEN_SEGMENT
```

This will define all the callable routines in the object module as being external to your program... the assembler won't barf when it fails to find these labels, and will leave them for the linker to resolve. This having been done, you can call these things as if they were part of your code. The advantage in doing this is that the assembler will not have to assemble these routines each time you want to re-assemble your program.

I've assumed that you will be using near calls to these routines. If you intend to handle it with far calls, change all the NEARs to FARs and adjust the _LONG equate in the video module before you assemble it.

If you are writing in C, you can just call these functions as if they were intrinsic library routines that had come with your compiler. The compiler will assume that any functions it can't find are external, and leave them for the linker to resolve.

In order for the linker to include this code in your program, whether it be in assembler or C, you will have to have previously assembled... but not linked... the video module, leaving you with VIDEO.OBJ, assuming that you called your source file VIDEO.ASM. As with the assembler, in linking VIDEO.OBJ to a C program the setting of _LONG in the video module source code will have to agree with the memory module your compiler is set to. Set _LONG true if you are using a large memory model. Most of the time, one uses the small model.

In linking VIDEO.OBJ to one's program, one would invoke the linker as follows.

```
LINK PROGRAM + VIDEO
```

for an assembly language program and... probably...

```
LINK C + PROGRAM + VIDEO
```

for a C file. The first "C" in the list is the C language header, which varies from compiler to compiler. In the real world one normally has a number of other parameters on the command line too, telling the linker about where to put the resulting EXE file, which libraries to search in the case of a C program and so on. These would be left as they usually are... just add the reference to VIDEO.OBJ.

Out Yonder Window

Because of the incredible speed of this code, it's possible to do a very slick trip with stuff that really isn't considered to be practical on the PC. One of the areas that you can apply this approach to is window management, which, of course, looks very professional and is presently *the* supremely trendy use for computers with colour tubes. We'll be looking at some window management code in an upcoming Computing Now!. **CN!**

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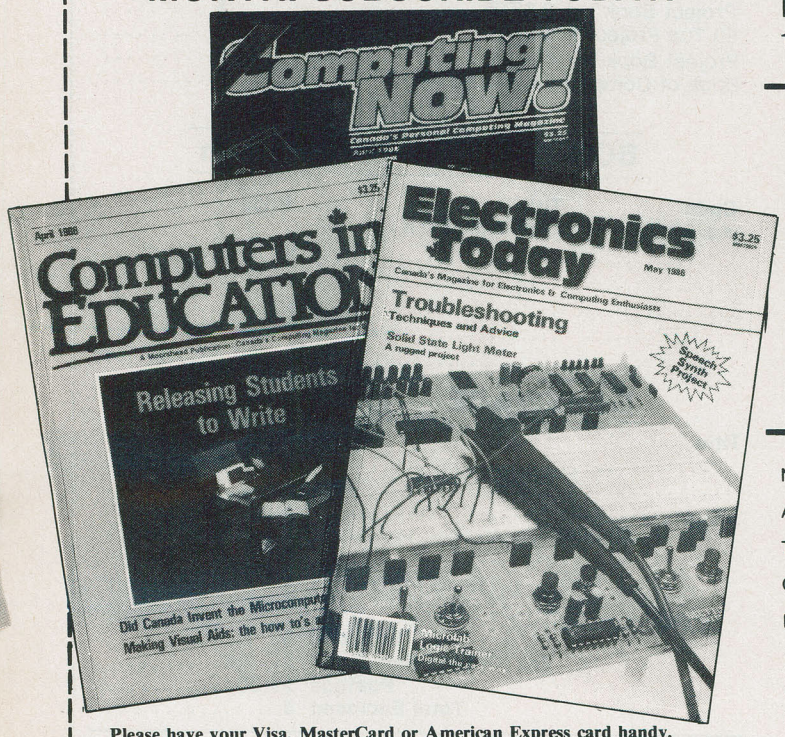

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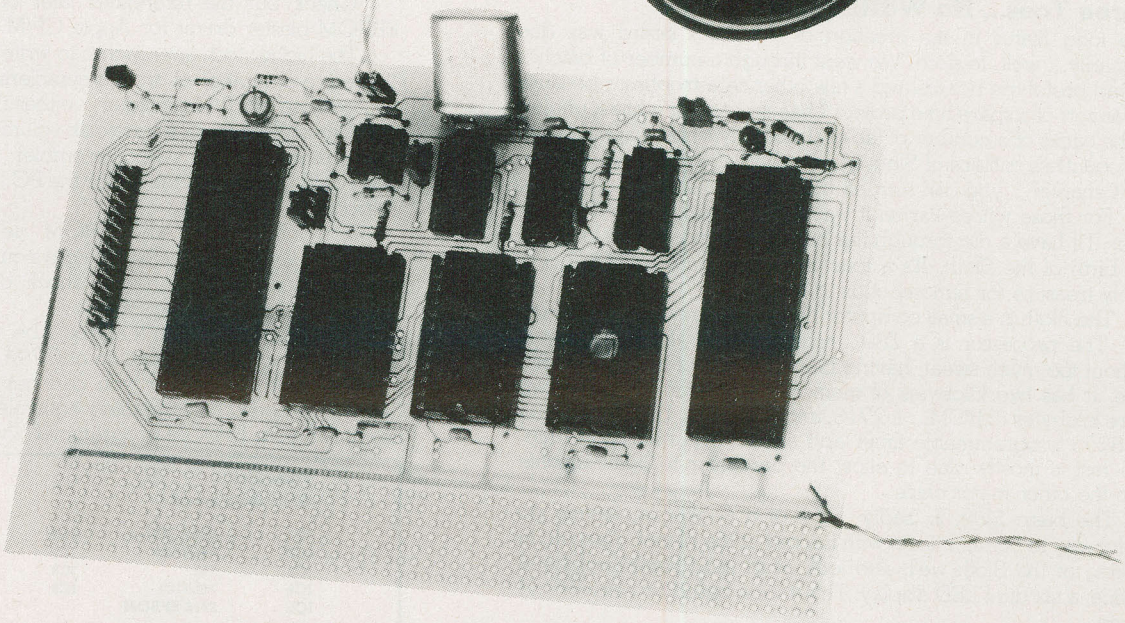
The Return of the Sloth



It's been a while, but out of the mire of resistors and permanently blasted EPROMs the Sloth single board computer has risen once more to take its rightful place in the fluorescent lights of glory. In this installment in the adventure we'll look at actually building the thing and getting some software going on it.

by Steve Rimmer

Quite a long time back... about a year ago, actually... we featured a few articles on building a Sloth. Many heads who missed the appropriate magazines may wonder why one might want a homemade sloth when natural sloths are so plentiful in many parts of the world, as well as being almost totally useless for most imaginable purposes. The prospect of constructing one may also sound a bit distasteful, what with all those internal organs and sloth bodily fluids oozing about one's work space.

In fact, I'm quite content to leave the creation of naturally occurring sloths to whatever divine beings or natural forces actually are responsible for such activities. However, synthetic sloths are potentially easier to get together... if there isn't a parts shortage... and phenomenally more useful. The sloth in question is, in fact, a small computer.

Whereas most computers of the sort that one sees on the desks of middle management polyester tycoons have floppy disks and printers and the like attached to them... and heavy internal workings inside... the Sloth is unique because it's simple. It can be built by anyone who can figure out which end of the soldering iron was intended for holding onto and, thereafter, turned into all sorts of custom gadgets.

The Sloth is a single board dedicatable microcontroller, a small computer with relatively modest capabilities which can be programmed to handle functions like intelligent temperature control, counting events, sensing remote phenomena and so on. It's based on easy to get parts and is adaptable to a vast variety of tasks. It will not manage databases, but then, most computers dislike doing that at the best of times.

In this feature we're going to get into the actual construction of the Sloth... at long last... and look at the rudiments of programming the beast.

The Return of the Sloth

If all this Sloth is new to you, you might want to check out the previous two articles in which it was given birth... they're listed in the references elsewhere in this feature. Dedicated processor boards like this one and the writing of firmware to drive them is a singularly rewarding sort of programming, one in which you have control over every bit of the computer you're working with. In addition, of course, you can create some really remarkable things based on the Sloth.

Three Toes... No Waiting

The long hiatus in the creation of the Sloth board was due primarily... well, to sloth. We went through a number of batches of bad prototype boards and a few other catastrophes... because it was sort of a spare time project it has spent a fair while lounging at the backs of a number of tables. I offer my sincere apologies to the countless millions of Sloth freaks who have been awaiting the next chapter... you can turn off the neon protest sign now.

For those whose karma it was to miss the first two Sloth articles, I'll have a dig through the basis of Slothing, Sloth lore and the birth of the Sloth. It's a touching story, one that you'll probably treasure for nanoseconds to come.

The Sloth is a small computer based on parts that are easy to get. The processor is a Z80... which should still be available without too much sweat, having been the chip of the gods at one time. It has two kilobytes of memory... an Hitachi 6116... two more kilobytes of ROM... a 2716, and some I/O. The I/O is an Intel 8253 programmable timer and an 8255 parallel port chip. The rest is mostly glue to allow the processor to communicate with the other major chips.

The basic Sloth is, sadly, a bit of a vegetable, having no useful way to communicate with the rest of the planet. As such, in looking at the Sloth we'll also look at its most basic peripheral device, a six digit LED display. This, too, is based on easily found silicon.

The most useful part of the Sloth... from the point of view of having it get some applications together... is the 8255. This gives it three eight bit ports, one of which will usually be tied up driving the LEDs. The others can read temperature sensors, drive motors, check out a keyboard and so on. We'll get into a bit more of this later on.

The Sloth is built on a double sided printed circuit board... the board pattern is available to anyone who wants it... check out the sources box later on... but double sided boards are nasty, expensive things in quantities of one and you'll probably find that unless you plan to have a whole lot of Sloths running around your digs, it's a lot cheaper to get one from us.

In building the Sloth, make sure that you put the sockets on the right side of the board. This may sound fairly obvious... well, it is for most of the Sloth. The sockets for the LED displays, however, go on the back of the board. This wasn't a mistake in playing with the CAD program... having done it this way, you can cut the LED display board from the main board and flip it up ninety degrees to have it look out through the front of a box.

The two rows of holes at the right side of the main board and the left of the LED board are intended to hold double rows of header pins. The two boards are joined with a ribbon cable having female twenty-six pin header connectors at each end... that's three eight pin ports plus power and ground. At such time as you want to add more devices to the I/O ports of the Sloth, you can get a longer chunk of ribbon cable and clomp on some more header connectors.

Programming It

Programs for the Sloth are written with an 8080 or Z80 assembler and blasted into EPROMs, which can then be plugged into the EPROM socket of the board and run. This is a lot more cumbersome than conventional programming, but it's also where all the challenge of the Sloth lies. Firmware programming is an art all by itself, and quite a lot of fun when you get into it... assuming you have lots of blank EPROMs.

To this end, you will need a computer which can run a suitable assembler and blast PROMs. There are a number of ways to get this together... I actually wrote the initial diagnostics with an Apple running CP/M, a custom driver program and an Exceltronix Apple PROM blaster. This is a surprisingly good way to get this together... while the Apple under CP/M is a bit slow, it makes a comfortable development system. Bear in mind that you'll never be generating more than two kilobytes of object code, as this is the limit of a 2716.

Check out the references later on in this article for the EPROM blaster driver for Apple CP/M.

The higher tech approach is to write the code on an IBM PC. There are a number of cross assemblers available for the PC, or you can use a CP/M emulator... either the Z80/MU program on our Almost Free PC Software disk volume eleven or a V20 chip... and a regular CP/M based assembler. There are a number of good EPROM programmers for the PC... including one from Exceltronix.

You'll also need an EPROM de-blaster, a short wave ultraviolet lamp to clean the little guys out and get them ready for reprogramming. Once again, check out reference list in this feature for a really cheap one.

I'm going to assume that you'll be writing the code for the Sloth under some manifestation of CP/M. In this case, you'll need an assembler... whatever you can get along with... DDT, the CP/M debugger, or something equivalent... and whatever you use to run your EPROM programmer. I've done up the exerciser program in this feature for assembly MAC... that is, I've kept it using 8080 instructions and a couple of Z80 op codes, which are handled by macros. For this reason, you can't get it together with ASM. If you want to make more extensive use of the Z80 stuff, you should score Z80.LIB, which contains all of the Z80 instructions as macros.

Parts List

(Sloth main board)

IC1	Z80A (Zilog)	IC6	6116 (Hitachi)
IC2	74LSA04	IC7	74LS37
IC3	555	IC8	B253 (Intel)
IC4	74LS139	IC9	8255 (Intel)
IC5	2716 EPROM		

C1	22uf tantalum
C2	not used
C3, 4, 5, 6	.1 uf

Plus nine .1 uf bypass capacitors

R1.4	10K
R2	not used
R3.9	1.5K
R5	100K trimmer, Bourns 3329P-100K
R6	560 ohms
R7	47 ohms
R8	10 ohms

D1	1N4001
01	MPSA13

Other bits: board, speaker, dual thirteen pin male header strip, 2.0 Mhz crystal, several small bits of single male header strips, sockets.

(Sloth display board)

IC10	74LS05
IC11	74LS138
IC12.13	7437 or 74LS37
IC14	4511
IC15-20	MAN74A LED display

R9-15	10 ohms

Other bits: board, dual thirteen pin male header strip, two dual thirteen pin female header connectors with some ribbon cable between them, sockets.

Doctor, My Eyes

In order to write programs for the Sloth, it's important that one understand a few bits about how it works. There are a number of things that the circuit diagram just doesn't say.

When you first power the Sloth, the capacitor on the reset pin of the Z80 will be a dead short to ground, and will stay that way for a while as it charges up. After a few milliseconds it will reach five volts. By this time, the Z80 will have stabilized and the reset pin going high will cause it to execute an immediate jump to location zero. If there is some code there, it will execute what it finds and... hopefully... do something. To this end, the base of the 2716 EPROM lives at 0000H. The two kilobytes of RAM live at 4000H. This space is used for scratch buffers, a stack and so on.

The two peripheral chips, the 8253 and the 8255, are what are called "port driven", that is, they appear to the Z80 as a series of logical ports, and are communicated with using the IN and OUT instructions.

Once again, the earlier Sloth articles will explain how these chips are assigned to specific port addresses.

The 8253 starts at port 08H, with the 8255 at 04H. Both devices actually use four consecutive ports each.

Perhaps the trickiest aspect of the Sloth is the way in which it runs its LED display. This presented an interesting design problem in the creation of the board, as the really elegant way to get it together entailed the use of expensive, fairly scarce chips. The display as it exists gets around this, but the processor has to constantly refresh it... the data that drives the LEDs must be sent to the A port of the 8255 about a hundred times a second if the numbers are to appear constant.

Obviously, it would be a drag to have to write a program which was constantly scooting away to get this together. In fact, the amount of processor overhead that's required to refresh the digits in minimal, and not really a hassle. It's just inconvenient to have to write this function into everything the Sloth runs.

The solution to this is to play with the Z80's NMI line. Every time this pin on the chip is pulled, the Z80 does a sort of call to location 0066H. Assuming there is either some code or a jump to some code at this point, the processor will execute whatever is intended to happen when the NMI line is hit.

In this case, we'll have code to update the LEDs as the NMI handler. To make sure it gets called regularly, we'll have a hundred hertz pulse zapping the NMI pin. If you look at the board overlay here, you'll be able to find the NMI source jumper right beside the 555 timer. This determines where the hundred hertz pulse is going to come from.

Having the NMI line belted at regular intervals can be useful for a number of things besides running the digits. For example, it can update a real time clock if your application calls for one. To this end, it is often important to know that the pulse hitting the NMI pin of the Z80 is exactly a hundred hertz, that is, that it's crystal controlled.

The pulse can come from one of two places. If you need an exact pulse, it can be derived from the 8253, as we'll get into in a moment. This has the disadvantage, however, of tying up a third of this chip just running the NMI line. If you just want the NMI handler to refresh the digits... which doesn't really entail any heavy accuracy... you can get the pulse from the 555 chip, which is on the board for just this reason.

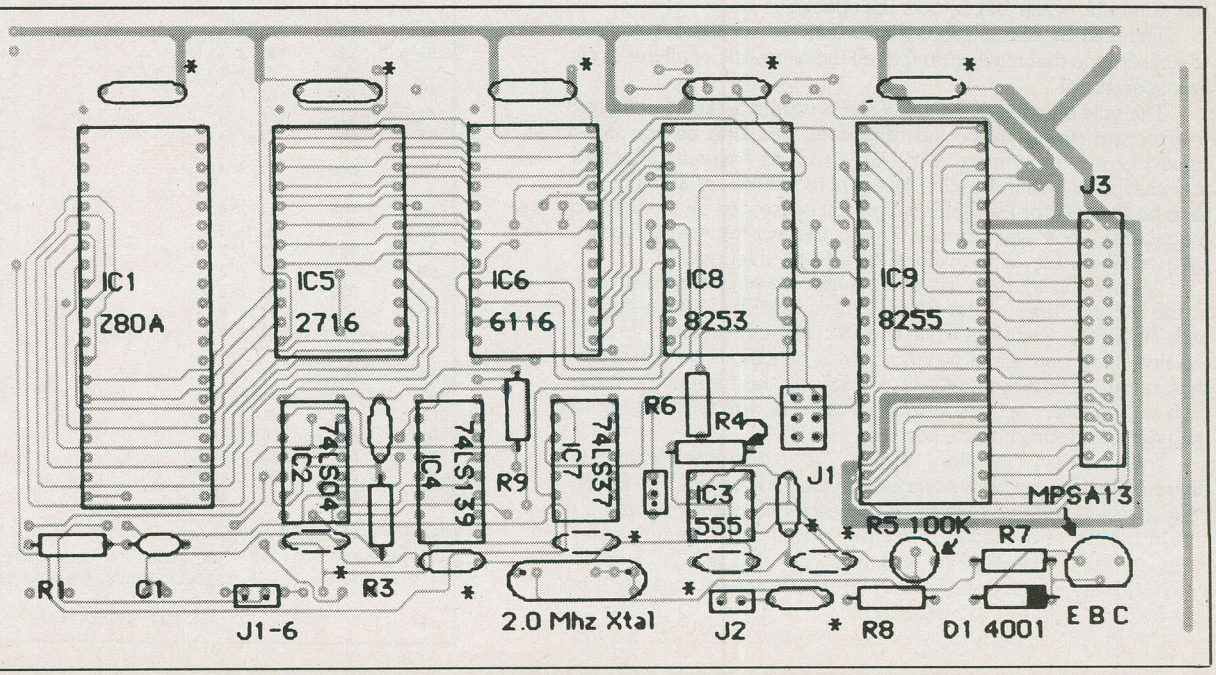
The 8253 is probably the least obviously useful part on the board. It's a three section programmable timer or, for our purposes, a programmable frequency divider. If one sends a string of pulses into one of its clock inputs and programs it with a number, a string of pulses will spew out of the corresponding output of a frequency equal to the input divided by the number. The number can be anything from one to sixty-five thousand and some.

If the input is the two megahertz board clock and the divisor is twenty thousand, the output of the timer will be one hundred hertz. However, unlike the frequency of the 555 timer, which can drift around for any number of reasons, the output of the 8253 will be as accurate as the crystal clock that drives the processor.

Having the NMI pulse generated through the 8253 has several other advantages. Being controlled programmatically, it can be altered later on. You could, for example, have a program which stopped the NMI pulses temporarily to give the processor more time to do something else. Alternately, if you wanted to be able to use the A port of the 8255 as an input device as well as the output for the LEDs, you could stop the refreshing of the digits while you wanted to read the port.

I said that the timer chip actually had three sections. The first having been spoken for, it's probably worth looking at the second one. It runs the speaker, driving the MPSA13 transistor with a waveform, again derived from the system clock. Because its frequency can be programmably altered, it can bleep at any pitch one wants it to. We'll get into this a bit more heavily in a second when we look at the source code for the exerciser.

The third timer is undefined, and can be used for whatever you can think of doing with it. Actually, all three timers can be used for other things if you don't mind using the 555 to drive the NMI line... or if you don't need the digits at all... and if you want



Where all the bits go on the sloth. The unmarked capacitors with asterisks near 'em are .1 uf bypass caps. The jumper blocks are made up of sections of male header pins. Power can be connected to the heavy traces at the top of the board... the uppermost one, on the parts side of the board, is ground. The one below it, on the solder side of the board, should be connected to five volts that's good for at least half an amp. The IRQ jumper, J1-6, should be connected. The jumper between IC7 and IC3 is the NMI source jumper. Connect the top two pins to get the NMI timing from the 8253. The six pin jumper south east of the 8253, J1, is the timer jumper. Connect the upper two pins on the right side of this jumper block.

to forgo having the speaker beep on command.

Authentic Code

The source code for the exerciser... got to it at last... is a good skeletal program for anything you eventually write on the Sloth. When it has been assembled and blasted into an EPROM, it will make the Sloth show off what it's currently capable of doing. The LEDs should come up and show you the number 012345, followed by a string of zeros, then ones... all the way up to all nines. The speaker will play a tune and the digits will start counting from one hundred... or whatever you set the STDISP equate to... on up to sixty-five thousand if you let it go that long, with the speaker squeaking about once a second.

It's not very exciting in absolute terms, of course, but if everything behaves as it should you'll know that the Sloth is working and ready for bigger things.

The source code starts at an ORG of 0000H so that it will be invoked when the Z80 does its restart sequence on power up. The first thing that we must do is to set the stack pointer, that's the SP register, to point to the base of the stack in memory. Trying to push things onto an undefined stack, or to call a subroutine before the stack has been established, can be highly nasty.

The next bit sets up the 8255... I won't get into just what the mode value of 89H means just now... programming the 8255 in all its complexity is a subject for an article in itself. Set up this way, the port will behave in a fairly useful fashion for the sorts of things we're going to do with it.

The next bit of the code sets up the first timer, timer 0, to drive the NMI clock. In this application we'll be using the 8253 to drive the NMI, with the 555 doing nothing much to speak of.

The decimal buffer, up in the RAM memory, holds the currently displayed number. It's six bytes long, with each byte holding the actual number you want displayed. As we'll see in a minute, it's usually loaded by a routine which converts a binary number into a six byte string.

At this point we jump over the NMI handler vector, which must be at 0066H. In fact, if space gets tight in the ROM you can put the handler itself here.

The main part of the code, starting at 0069H in this case, should be fairly easy to understand. The first bit loads the decimal buffer with increasing values from zero to five. At this point, the 8253 will have started sending pulses to the NMI line, the digits will have been fired up and these numbers will appear on the display. The WAIT routine kills some time so one can actually see the numbers, while BELL toots the speaker.

The next bit of code runs through all the numbers from zero to nine so you can make sure that all the segments of all the digits are operational.

The note equates at the top of the program make it fairly easy to program simple music into the Sloth... as long as you don't mind playing everything in the key of C, as I haven't included any sharps or flats in this list. These note values are actually sixteen bit divisors for the 8253 which will cause it to divide the two megahertz clock waveform down to the appropriate pitches... give or take a bit, as the values have to be integers.

To play a note, then, we must output the appropriate divisor to the second timer of the 8253... that's TIMER1, as we started with TIMER0... wait for a while and then reset the timer to turn off the note. The process of waiting here is handled a bit differently than is the waiting in the WAIT routine. As the frequency of the NMI pulse is very accurate, we can use it to wait for times set to the nearest hundredth of a second.

The memory location WAITC is a counter which is decremented by the NMI routine each time it is called. The PLAY code is called with the note to be played in HL and its duration... in hundredths of a second... in DE. To wait for the time in DE, then, we stash DE in WAITC and then loop until WAITC is zero. The NMI handler will transparently count it down without any further help, as we'll see in a moment.

The PLAYS code is quite crude... it plays each note for the

This program will test out the sloth. You'll need the CP/M MAC.COM to assemble it as it is, although it can easily be adapted for other assemblers. Burn the code into a 2716 EPROM, plug it into the Sloth and turn the juice on. The macros handle the Z80 specific op codes... if you want to use Z80 codes that I haven't included macros for here, use the Z80.LIB file.

```
;       SLOTH FIRMWARE - GENERAL EXCERCISER,
;       GREMLIN REMOVING AND DEMO

;       COPYRIGHT (c) 1984,85,86ad
;       STEVE RIMMER
;       THIS VERSION FOR MAC

;       ...VERSION 1.10
;

;;;     *- MEMORY EQUATES -*
RAM     EQU     4000H   ;START OF RAM
ROM     EQU     0000H   ;START OF EPROM
RAMTOP  EQU     5FFFH   ;TOP OF RAM
INTER   EQU     0066H   ;INTERUPT VECTOR HANDLER

;;;     *- 8255 EQUATES -*
P8255   EQU     4       ;BASE PORT FOR 8255
MODE    EQU     89H     ;8255 MODE CONTROL
SELECT  EQU     P8255   ;PORT TO SELECT DIGIT
RESET   EQU     P8255+1 ;PORT TO RESET 8255
IOSET   EQU     P8255+3 ;PORT TO PROGRAM 8255

;;;     *- 8253 EQUATES -*
P8253   EQU     8       ;BASE PORT FOR 8253
TMODE   EQU     P8253+3 ;MODE CONTROL PORT
TIMER0  EQU     P8253
TIMER1  EQU     P8253+1
TIMER2  EQU     P8253+2


;;;     *- MUSICAL NOTE DEVISOR EQUATES -*
A1      EQU     36363
B1      EQU     32394
C1      EQU     30576
D1      EQU     27241
E1      EQU     24269
F1      EQU     22907
G1      EQU     20408

A2      EQU     A1 / 2
B2      EQU     B1 / 2
C2      EQU     C1 / 2
D2      EQU     D1 / 2
E2      EQU     E1 / 2
F2      EQU     F1 / 2
G2      EQU     G1 / 2

A3      EQU     A1 / 4
B3      EQU     B1 / 4
C3      EQU     C1 / 4
D3      EQU     D1 / 4
E3      EQU     E1 / 4
F3      EQU     F1 / 4

G3      EQU     G1 / 4

A4      EQU     A1 / 8
B4      EQU     B1 / 8
C4      EQU     C1 / 8
D4      EQU     D1 / 8
E4      EQU     E1 / 8
F4      EQU     F1 / 8
G4      EQU     G1 / 8

A5      EQU     A1 / 16
B5      EQU     B1 / 16
C5      EQU     C1 / 16
D5      EQU     D1 / 16
E5      EQU     E1 / 16
F5      EQU     F1 / 16
G5      EQU     G1 / 16

;;;     *- ODD EQUATES -*
DISBRT  EQU     2FH   ;HOW LONG TO DELAY AFTER DIGIT TURN ON
STDISP  EQU     100   ;START VALUE FOR COUNTER

;;;     *- MACROS TO FAKE OUT Z80 EXTENSIONS FOR MAC -*
```

```
@CHK    MACRO   ?DD
        IF (?DD GT 7FH) AND (?DD LT 0FF80H)
        'RELATIVE JUMP OUT OF RANGE'
        ENDIF
        ENDM
LDX     MACRO   ?R,?D
        @CHK    ?D
        DB      0DDH,?R*8+46H,?D
        ENDM
LDY     MACRO   ?R,?D
        @CHK    ?D
        DB      0FDH,?R*8+46H,?D
        ENDM
STX     MACRO   ?R,?D
        @CHK    ?D
        DB      0DDH,70H+?R,?D
        ENDM
STY     MACRO   ?R,?D
        @CHK    ?D
        DB      0FDH,70H+?R,?D
        ENDM
LXIX    MACRO   ?NNNN
        DB      0DDH,21H
        DW      ?NNNN
        ENDM
LXIY    MACRO   ?NNNN
        DB      0FDH,21H
        DW      ?NNNN
        ENDM
EXAF    MACRO
        DB      08H

        ENDM
EXX     MACRO
        DB      0D9H
        ENDM
INXIX   MACRO
        DB      0DDH,23H
        ENDM
INXIY   MACRO
        DB      0FDH,23H
        ENDM
BIT     MACRO   ?N,?R
        DB      0CBH,?N*8+?R+40H
        ENDM
JR      MACRO   ?N
        DB      18H,?N-$-1
        ENDM
JRNC    MACRO   ?N
        DB      30H,?N-$-1
        ENDM
RETN    MACRO
        DB      0EDH,45H
        ENDM
DSBC    MACRO   ?R
        DB      0EDH,?R*8+42H
        ENDM
DJNZ    MACRO   ?N
        DB      10H,?N-$-1
        ENDM

;;;     *- START OF CODE -*
        ORG     ROM

START:  LXI     SP,STACK        ;INITIALIZE STACK POINTER

        MVI     A,MODE          ;SELECT 8255 MODE
        OUT     IOSET           ;OUTPUT IT

;INITIALIZE 8253
; SET UP MODE WORD FOR TIMER
; 00110110B
;         ^ SET TO 0 FOR 16 BIT COUNT, 1 FOR DECADE
;      ^^^  3 BITS SET MODE. THIS IS MODE 3
;    ^^     READ/LOAD. THIS SETS FOR LSB THEN MSB LOAD
; ^^        WHICH COUNTER INVOLVED. THIS MEANS COUNTER 0

; SET UP TIMER ONE TO GENERATE 100 HZ FOR INTERUPT
; LINE. SEND LOW BYTE FIRST, THEN HIGH BYTE
; (78 * 256) * 32 = 20000
; 2 MHZ / 20000 = 100 HZ

        MVI     A,00110110B
        OUT     TMODE           ;INITIALIZE TIMER0
        LXI     H,20000         ;GET DIVISOR (SLOPPY, I KNOW)
        NOP
        NOP                     ;KILL SOME TIME
        MOV     A,L
        OUT     TIMER0          ;SEND LSB OUT
        NOP
        NOP                     ;KILL MORE TIME
        MOV     A,H
        OUT     TIMER0          ;SEND MSB OUT
        NOP
        NOP             ;TIMER IS NOW SENDING 100 HZ PULSES

;INITIALIZE DECIMAL BUFFER - LOAD IT WITH ALL ZEROS
        LXI     H,DECBUF;POINT TO DECBUF
        MVI     A,0     ;GET THE ZEROS(REAL ZEROS, NOT ASCII)
        MVI     B,6     ;SIX DIGITS
INITLP: MOV     M,A     ;LOAD BUFFER
        INX     H       ;BUMP POINTER
        DJNZ    INITLP  ;DECREMENT AND LOOP

;INITIALIZE THE LEDS
        MVI     A,0     ;ZERO A
        OUT     SELECT  ;RESET LEDS
        OUT     RESET   ;RESET SELECT LINES

        CALL    WAIT    ;ONE SECOND DELAY
        CALL    BELL    ;TOOT THE SPEAKER

        JMP     MAINCD  ;JUMP TO REST OF CODE

;NMI HANDLER CODE OR JUMP TO CODE HAS TO GO HERE
        ORG     INTER   ;INTERUPT VECTOR
        JMP     NMIHAN  ;JUMP TO ROUTINE - LET'S BE SLOTHFUL

        ORG     69H     ;RIGHT AFTER THE VECTOR

;;;     *- MAIN CODE STARTS HERE -*
MAINCD: LXI     H,DECBUF ;FIRST, SHOW 012345
        MVI     A,0
        MVI     B,6
DECI1:  MOV     M,A
        INR     A
        INX     H
        DCR     B
        JNZ     DECI1

        CALL    WAIT    ;LET IT SIT A SECOND OR SO
        CALL    BELL    ;BLEEP

        MVI     A,0     ;NOW SHOW ALL 0'S, THEN ALL 1'S, ETC
DECI3:  LXI     H,DECBUF
        MVI     B,6
DECI2:  MOV     M,A
        INX     H
        DCR     B
        JNZ     DECI2
        CALL    WAIT
        INR     A
        CPI     10
        JNZ     DECI3

        LXI     H,SONG          ;NOW POINT TO THE SONG
        CALL    PLAYS           ;AND PLAY IT

;AT THIS POINT, THE PROGRAM GOES INTO A LOOP AND SHOWS AN
 INCREMENTED
;VALUE ON THE DISPLAY... CHANGING ABOUT ONCE A SECOND...
 UNTIL THE
;COMPUTER IS RESET. IT SOUNDS THE BELL AT EACH CHANGE UNTIL
 THE SPEAKER
;GETS RIPPED OUT IN FRUSTRATION
        LXI     H,STDISP        ;LOAD H WITH STARTING VALUE
DTESTL: PUSH    H               ;SAVE THE VALUE
        CALL    DECOUT          ;LOAD IT INTO THE DECIMAL BUFFER
        CALL    BELL            ;SOUND THE BELL
        CALL    WAIT            ;AND PAUSE A SECOND OR SO
        POP     H               ;GET THE VALUE BACK
        INX     H               ;AND INCREMENT IT
        JR      DTESTL

;;;     *- SUBMARINES AND HANDLERS -*

;PLAY THE NOTE IN HL FOR D * .01 SECONDS
PLAY:   PUSH    PSW
        PUSH    H               ;SAVE AFFECTED REGISTERS
```

same duration. It could have been done with quite a bit more sophistication. You might want to try to improve on it as a simple programming project for the Sloth.

The rest of the program is a small loop which displays an increasing value on the LEDs by repeatedly calling DECOUT. The DECOUT routine is a really elegant little decimal conversion routine which will take the value in HL and stash it as a string in the DECBUF so the NMI handler can find it.

The NMI handler is arguably the most interesting aspect of the code. It is called transparently to the rest of the program... at least, it is if it's written properly... and can be thought of as happening concurrently with whatever program you're running.

The primary function of the NMI handler is to refresh the digits, but, as we've already seen one can play a lot of interesting tricks on the system with it. The only really important thing about it is that it can't be allowed to trash any of the registers of the system.

There is a very interesting... if usually ignored... feature of the Z80 called "phantom registers". Along with the usual AF, BC, DE and HL registers that we're all familiar with, there is also a whole other set of these things, usually referred to as AF', BC', DE' and HL'. In fact, it's impossible to know which one is in use at the moment. What is important is that one can tell the processor which set of registers to bring to the foreground to use and which to have in the background and leave uncorrupted.

The register sets can be swapped back and forth with two instructions, EXAF to exchange the AF pair and EXX to exchange all the rest. Again, these are special Z80 instructions, so I've used DBs in their places in the NMI handler code. Using these things is much faster than pushing all the registers onto the stack, and gets around a number of potential stack peculiarities which turn up if one implements the Z80's INT line later on.

The decimal display routine is a good example of how one has to fiddle with data to get it to work right at the hardware level. If you look at the schematic for the display board, you'll notice that the eight bit port gets split up into two clumps of lines, one going to the 74LS138 to select which digit is going to be on and the other tottering off to the 4511 to decide which number is to show up on the digit in question.

As we only have one port involved, we must output six numbers which comprise both the digit selects and the digits themselves. The lower four bytes are the digit, while the upper three are the position. The highest byte isn't used. I was going to have this run the decimal points, actually, through the two leftover gates in one of the 74LS37s. Unfortunately, the timing delays in the gates kind of killed this.

Creating the lower four bits is easy... they're just the digit numbers, and already exist in the DECBUF exactly as we need them. It's a good idea to AND off the high order bits just in case, although we really shouldn't have to. The three high bits are the actual number of the digit we want to select rotated left four times to get them into the high bit positions. As we have a counter going to count up to six anyway, we can use the value of B to supply this number. We have to move it into A and back again as one can only rotate the accumulator.

Having created a display digit we have to output it to the 8255 and wait awhile. On the original prototype of the Sloth I used really tiny calculator style numbers and it was sufficient to just zap 'em and move on to the next digit. The larger numbers in this version want a good deal more drive current and, as such, we have to put a short delay in between digits. This is a bit of a waste of the processor... it would have been slicker to have used pulse stretchers on the display board, but this would have added three more chips to an already fairly complex board.

Sending a zero out to the 8255 will shut off all the digits. We have to do this so that the last one doesn't appear a whole lot brighter than all the others, which it would do if it were to be left on until the handler was called again.

```
        XCHG                    ;GET TIME VALE IN HL
        SHLD    WAITC           ;AND SAVE IT SO IT GETS COUNTED
                                 DOWN
        XCHG                    ;GET THE NOTE VALUE BACK
        NOP
        NOP
        MVI     A,01110110B
        OUT     TMODE           ;INITIALIZE THE TIMER
        NOP
        NOP
        MOV     A,L
        OUT     TIMER1          ;SEND LSB OF NOTE VALUE
        NOP
        NOP
        MOV     A,H
        OUT     TIMER1          ;SET TIMER FOR NOTE VALUE

PLAYL:  LHLD    WAITC           ;THIS LOOP WAITS UNTIL THE
        MOV     A,H             ;NMI HANDLER HAS DECREMENTED
        CPI     0               ;THE WAIT TIME TO ZERO...
        JNZ     PLAYL           ;PRETTY SLICK, WHAT...
        MOV     A,L
        CPI     0
        JNZ     PLAYL           ;WAIT FOR TIME OUT

        MVI     A,01110110B
        OUT     TMODE           ;RE-INITIALIZE TIMER TO SHUT IT UP

        NOP
        NOP
        POP     H
        POP     PSW             ;RESTORE REGISTERS
        RET

;KILL ABOUT A SECOND - COULD BE DONE BETTER WITH NMI TIMER
WAIT:   PUSH    H
        PUSH    D
        LXI     H,-1
        LXI     D,-1
WAIT1:  DAD     D
        JC      WAIT1
        POP     D
        POP     H
        RET

;PLAY THE TUNE POINTED TO BY HL
PLAYS:  MOV     E,M             ;GET THE LOW ORDER DIVISOR
        INX     H               ;POINT TO HIGH ORDER DIVISOR
        MOV     D,M             ;GET THE HIGH ORDER DIVISOR
        INX     H               ;POINT TO NEXT NOTE

        MOV     A,D             ;SEE IF HIGH ORDER DIVOSR IS 0
        CPI     0               ;
        JNZ     PLAYS1          ;IF NOT, MOST BE GOOD VALUE
        MOV     A,E             ;SEE IF LOW ORDER DIVOR IS ZERO
        CPI     0               ;
        RZ                      ;IF SO, MUST BE END OF THE LINE

PLAYS1: PUSH    H               ;SAVE POINTER
        XCHG                    ;GET NOTE VALUE IN DE TO HL
        LXI     D,20            ;SET DURATION
        CALL    PLAY            ;PLAY THE NOTE
        POP     H               ;RESTORE THE POINTER
        JMP     PLAYS           ;AND GET THE NEXT NOTE

;TOOT THE BELL
BELL:   LXI     H,G3
        LXI     D,7
        CALL    PLAY
        RET

DECOUT:
;CALL WITH VALUE IN HL, UPDATES BUFFER VALUE FOR DISPLAY
;THIS CODE ADAPTED FROM ROUTINE BY WM. BARDEN
        LXIY    BTABL           ;POINT TO CONSTANT TABLE
        LXIX    DECBUF+1        ;POINT INTO DECIMAL BUFFER
        MVI     A,0             ;SET UP FOR MOST SIGNIFICANT
        STA     DECBUF          ; ... DIGIT (ZERO OR OFF)
BIN05:  MVI     B,0FFH
        LDY     E,0
        LDY     D,1
        BIT     7,D
        RNZ
BIN10:  INR     B
        ORA     A
```

Assembling It All

Experienced machine language hackers will know that if you try to assemble and load a program that starts at location zero the loader will barf and refuse to complete the task, as this would mean overwriting the CP/M zero page space. In fact, we have to do some playing with some of CP/M's lesser known tools to wind up with a binary file suitable for blasting into a PROM.

The first thing to do is to assemble the source file.... assuming you've previously typed it in. I've used the MAC assembler in this example.

MAC SLOTH

This assumes that your source file is called SLOTH.ASM. This will leave you with, among other things, SLOTH.HEX. In order to load this into a suitable object file, you will have to use DDT.

```
DDT
NEXT PC
0100 0000
-ISLOTH.HEX
-R100
G0
SAVE 4 SLOTH.OBJ
```

This procedure loads the SLOTH.HEX file into DDT with an artificially offset ORG of 0100... set by the parameter after the R command. At this point, the program still ORGs out at 0000H... it's just stashed in memory starting at 0100H so as not to trash CP/M. The SAVE command will create a suitable binary file, ready for blasting into a PROM in whatever way you plan to get this together.

There's a lot more that can be said about the Sloth, but I think we'll leave it for another time. Much of what's cosmically profound about little boards like this one is the stuff you can find out for yourself. It's a great space to design in, and you really can make it do a lot of things you'd never have thought of getting together before.

The Sloth is designed for meddling with... don't be afraid to.

The Sloth is hardly the most sophisticated computer on the planet, but it can unquestionably become the universe's most profound electric toothbrush controller.

Sources and Stuff

Related articles:
EPROM Deblaster, Computing Now! June 1983
How to build an EPROM eraser for about twenty five dollars.

Sloth On A Z80, Computing Now!, June 1985
The introductory Sloth article.

PROM Night For Apple CP/M, Computing Now!, July 1985
A CP/M based driver for the Exceltronix Apple EPROM blaster card.

Sloth In Lights, Computing Now!, November 1985
An article about the Sloth digital display board.

A Most Amazing PC Accessory, Computing Now!, May 1986
The V20 chip for the IBM PC, which lets it run CP/M based software as well as MS-DOS applications.

Z80MU, Almost Free PC Software, Volume 11
A CP/M emulator which runs on the IBM PC and compatibles without the use of a V20 chip, allowing the use of CP/M based software on a PC.

Other stuff:
A set of updated schematics and a copy of the printed circuit board pattern can be had by sending us a large, stamped, self-addressed envelope... the envelope should be big enough to put this magazine in.

A set of photocopies of the above articles in Computing Now! is available for $7.00 if you send us a large, stamped, self-addressed envelope, again, large enough to put this magazine in.

An authentic sloth printed circuit board... this includes the display board... with a free set of updated schematics is available for $29.95 plus seven percent Ontario sales tax. Please allow six to eight weeks for delivery on this one. These boards will probably not be available after December 31, 1986.

```
        DSBC    D
        JRNC    BIN10
        DAD     D
        STX     B,0
        INXIX
        INXIY
        INXIY
        JR      BIN05

;TABLE OF CONSTANTS FOR THE DECIMAL OUTPUT ROUTINE

BTABL:  DW      10000,1000,100,10,1,-1

;TABLE DIVISORS TO PLAY FANFARE
SONG:   DW      C2,E2,G2,G2,G2,E2,E2,E2,C2,E2,C2,G1
        DW      C2,E2,G2,G2,G2,E2,E2,E2,G1,G1,G1,C2
        DW      0000H

;;;     *- NMI HANDLER CODE -*

;MUST SCAN DIGITS, UPDATE THE WAITC VALUE AND THE
;SYSTEM TIME CLOCK COUNT

NMIHAN: EXAF                    ;SAVE A AND FLAGS
        EXX                     ;SAVE THE OTHER REGS

;INCREMENT THE REAL TIME CLOCK
        LHLD    TIME            ;GET TIME
        INX     H               ;BUMP
        SHLD    TIME            ;STASH IT

;DECREMENT WAITC COUNTER
        LHLD    WAITC
        DCX     H
        SHLD    WAITC

;DISPLAY THE CONTENTS OF THE DECIMAL BUFFER
        LXI     H,DECBUF+5      ;POINTER INTO DECIMAL BUFFER
        MVI     B,6             ;SIX DIGITS

;MAIN DISPLAY LOOP
DISLP:  MOV     D,M             ;LOAD D WITH VALUE OF DIGIT
        MOV     A,B             ;LOAD A WITH DIGIT TO DISPLAY

;NOW SHOW THE DIGIT
        RLC
        RLC
        RLC
        RLC                     ;ROTATE INTO UPPER NYBBLE
        ANI     01110000B       ;SNUFF LOWER NYBBLE
        MOV     E,A             ;GET INTO POS. FIELD
        MOV     A,D             ;GET CHARACTER
        ANI     00001111B       ;MASK OFF HIGH GARBAGE
        ADD     E               ;ADD POSOTION

        OUT     SELECT          ;LET IT RIP
        PUSH    B               ;SAVE BC
        MVI     B,DISBRT        ;GET TIME TO WAIT WHILE LEDS ARE ON
DISLPI: DCR     B               ;COUNT IT DOWN
        JNZ     DISLPI          ;WAIT FOR WHILE
        POP     B               ;RESTORE BC

        DCX     H               ;BUMP POINTER
        DCR     B               ;SCRATCH COUNT
        JNZ     DISLP           ;LOOP 'TIL DONE

        MVI     A,0             ;SELECT NO DIGITS AND...
        OUT     SELECT          ;SWITCH OFF ALL DIGITS

        EXX                     ;RESTORE REGS
        EXAF                    ;RESTORE A AND FLAGS
        RETN                    ;RETURN FROM INTERUPT

;THESE ARE LABLES FOR POINTING INTO THE RAM MEMORY
 - GENERATE NO CODE
        ORG     RAM             ;START OF RAM BUFFER
        DS      40              ;STACK SPACE
STACK:  DS      2               ;STACK POINTER
DECBUF: DS      6               ;SCRATCH FOR DECIMAL CONVERTER
TIME:   DS      2               ;PLACE TO KEEP THE TIME
WAITC:  DS      2               ;COUNT DOWN FOR WAIT
        END


;;;     *- END OF CODE -*                                    CN!
```

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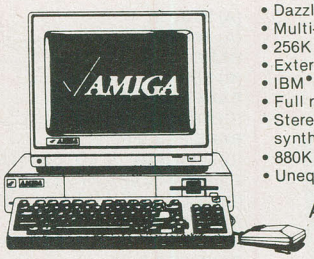

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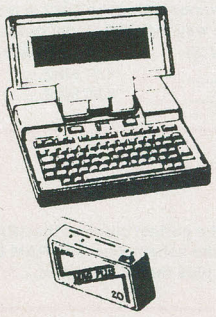

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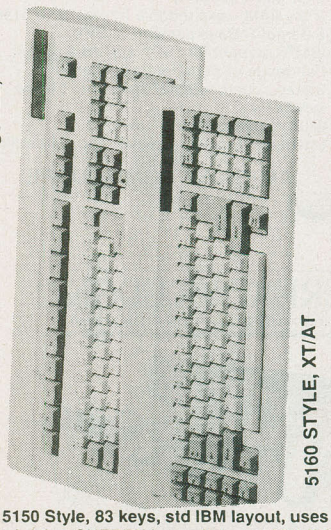

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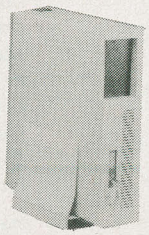

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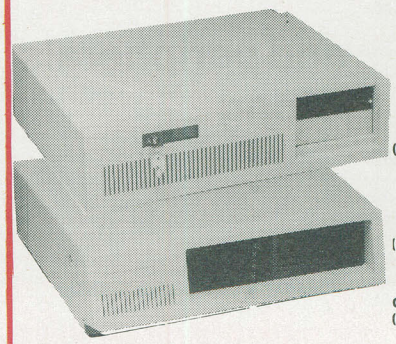

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Continued from page 7

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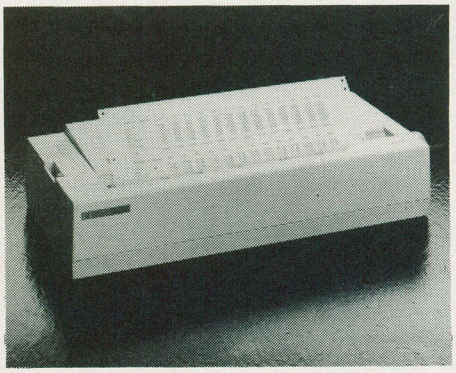

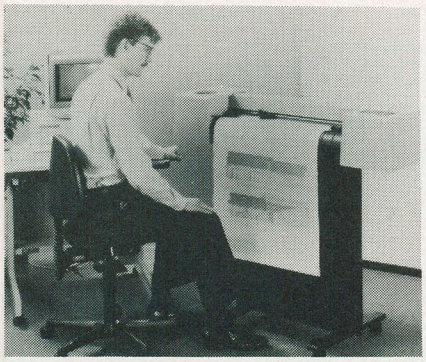

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BBS Software

Alchemy Mindworks announces a **new bulletin board package** for IBM PCs and compatibles, allowing customization of how the board looks to each user. Behaving as a menu driven system, or one running MS-DOS, CP/M or Unix, the board features integrated message and file exhange facilities, instantaneous message retrieval, tree command structure, multiple access levels and online help. A hard drive is recommended.

The package costs $99.00, with a local mode demo disk available for $12.00, and it's available from Alchemy Mindworks, P.O. Box 313, Markham, Ontario L3P 3J8. One system currently using it is at 1-416-274-8563, either 300 or 1200 baud.

The Missing Link

The Software Link has introduced version 4.0 of their multiuser, multitasking software, **MultiLink Advanced**, increasing the maximum number of users or tasks supported by one IBM AT or compatible from nine to seventeen. Supporting colour and graphics and SideKick on all RAM partitions, a proprietary disk caching system is also featured. Copy protection has been dropped, allowing easier use with a hard disk.

Costing $745.00, upgrades from earlier versions will also be available. Contact The Software Link at 250 Cochrane Drive, Suite 12, Markham, Ontario L3R 6B7, or by calling (416) 477-5480.

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Hard Apple

General Computer has introduced the HyperDrive FX/20, a twenty megabyte, **external hard drive for the Macintosh**. Among its features are a LaserWriter print spooler, a backup utility for copying hard disk files to floppies and a security program for encrypting data. The FX/20 can be chained to as many as seven other SCSI Macintosh peripherals.

Costing two thousand American dollars, it comes from General Computer, 215 First Street, Cambridge, Massechusetts 02142, telephone (617) 492-5500. **CN!**

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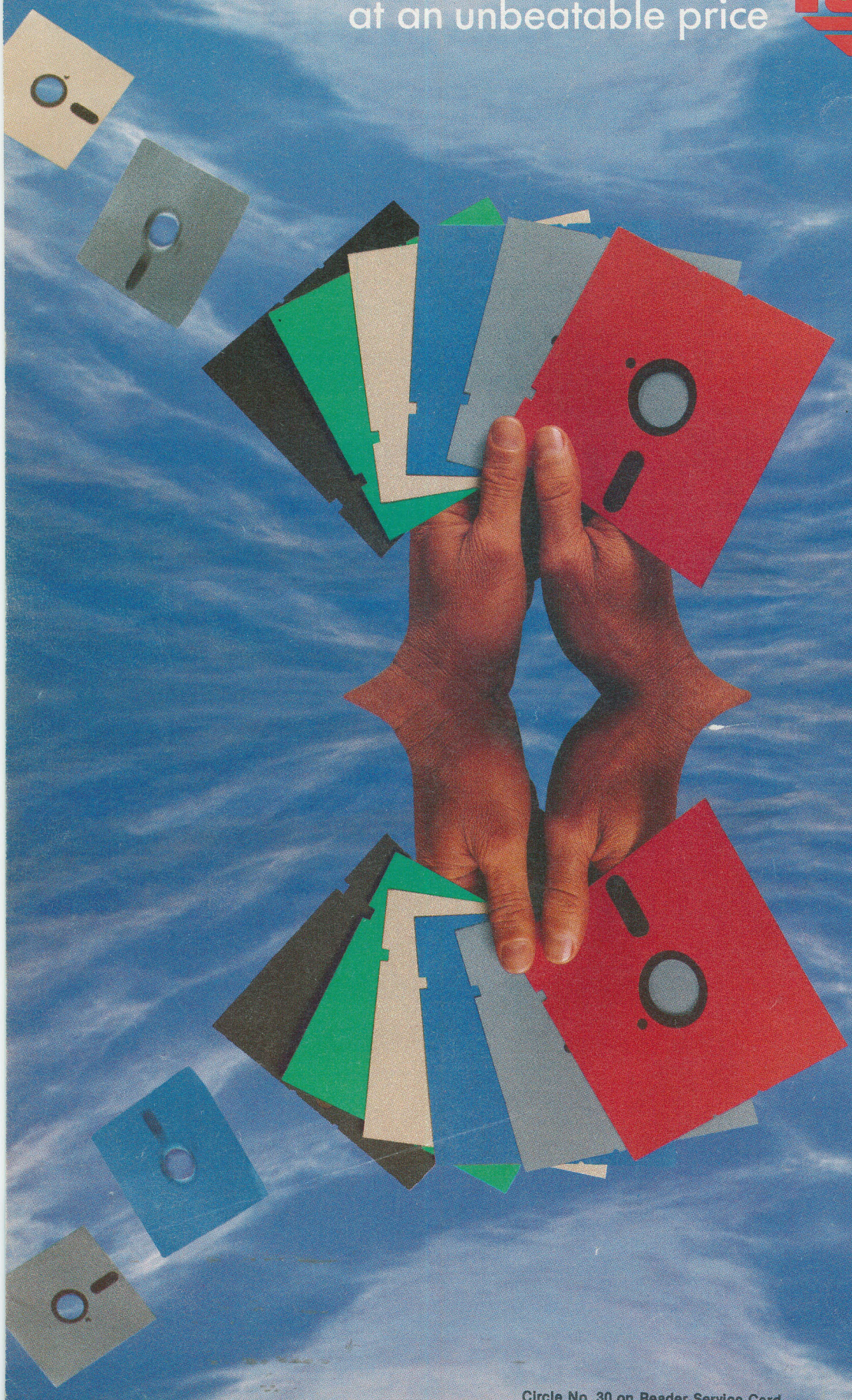

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